SEPTEMBER 1971

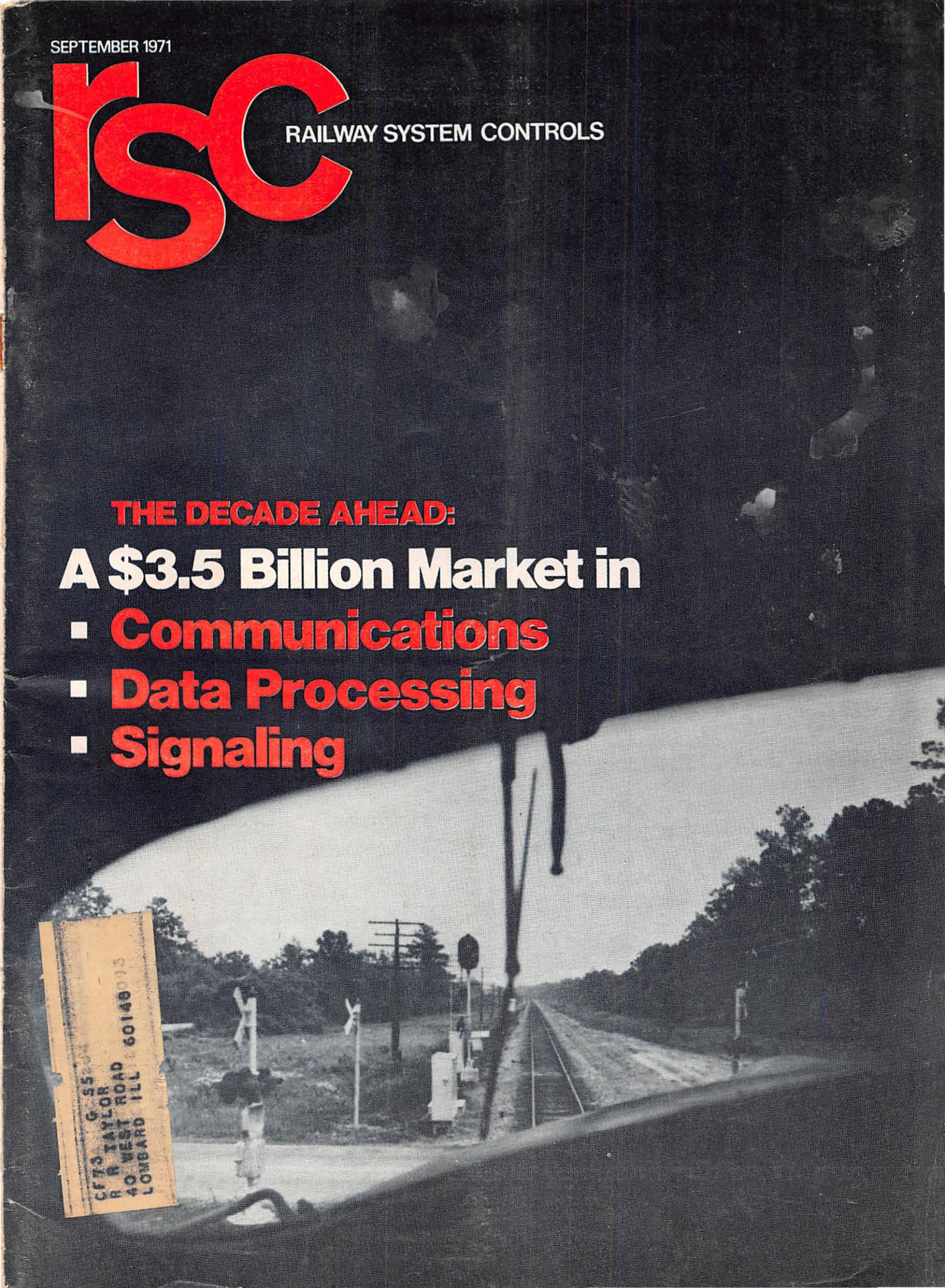
rsc

RAILWAY SYSTEM CONTROLS

THE DECADE AHEAD:

A $3.5 Billion Market in

- Communications
- Data Processing
- Signaling

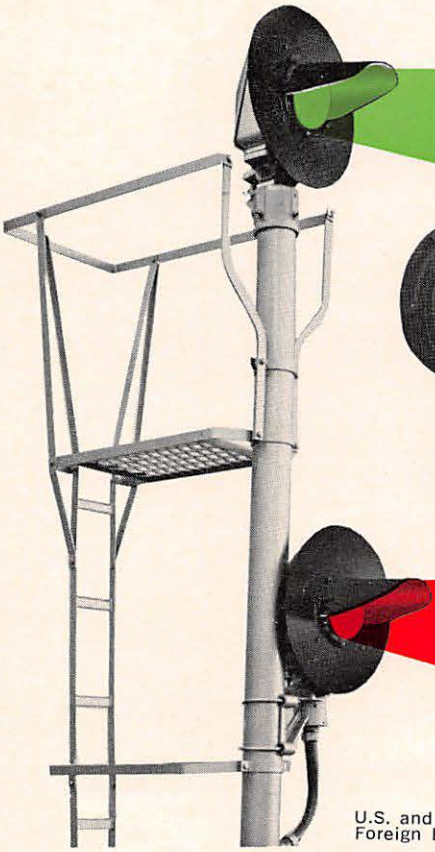


CF73 G SS
R R TAYLOR
40 WEST ROAD
LOMBARD ILL 60148

SEE *The UNILENS in Booths 501-502 at the AAR Annual Meeting*
Communication and Signal Section • Bal Harbour, Florida—Oct. 5, 6, 7, 1971

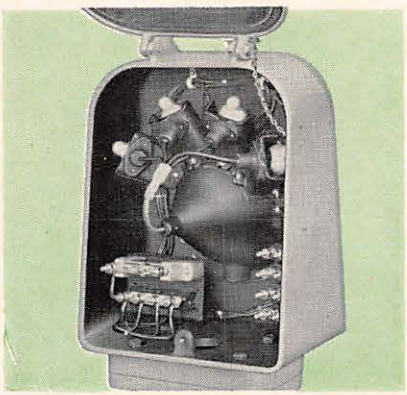
RACO® UNILENS®

COLORLIGHT SIGNALS



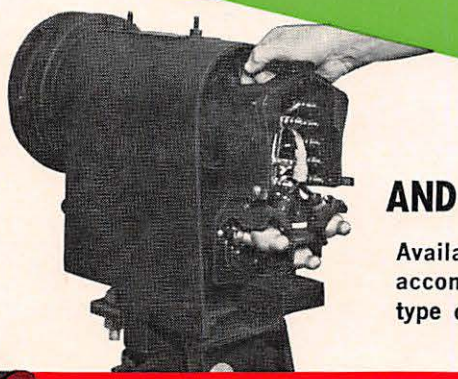
U.S. and Foreign Patents

All aluminum construction — available for Mast, Bridge or Bracket signal. Top or side of mast mounting. Also available for dwarf signal.



Interior view of light source and fibre optic system.

FOR TOTALLY NEW SYSTEMS . . .



AND CONVERSION UNITS

Available in seven variations to accommodate both stepped lens type or compound lens type.

28 RAILROADS AND TRANSIT SYSTEMS

have recognized the economies and advantages of the RACO UNILENS for new systems as well as conversion units when replacing multi-lens colorlight, semaphores and searchlight type signals.

UNILENS has no mechanism. The unique single lens color indication system eliminates the need for moving parts, repeating relays, associated circuitry and requires only minor circuit change when UNILENS conversion units are installed.

UNILENS utilizes 75% of the lamp output compared to 30% in colorlight signals of yesterday . . . thanks to a more efficient sealed beam light source and advanced design.

UNILENS provides a better signal at less cost . . . to buy . . . to install . . . and to maintain than any other type of wayside signal.

MEMBER RPI RAILWAY PROGRESS INSTITUTE

For complete details, contact:

Since 1920

RACO PRODUCTS ENGINEERED FOR LONG LIFE ®

Railroad Accessories Corporation

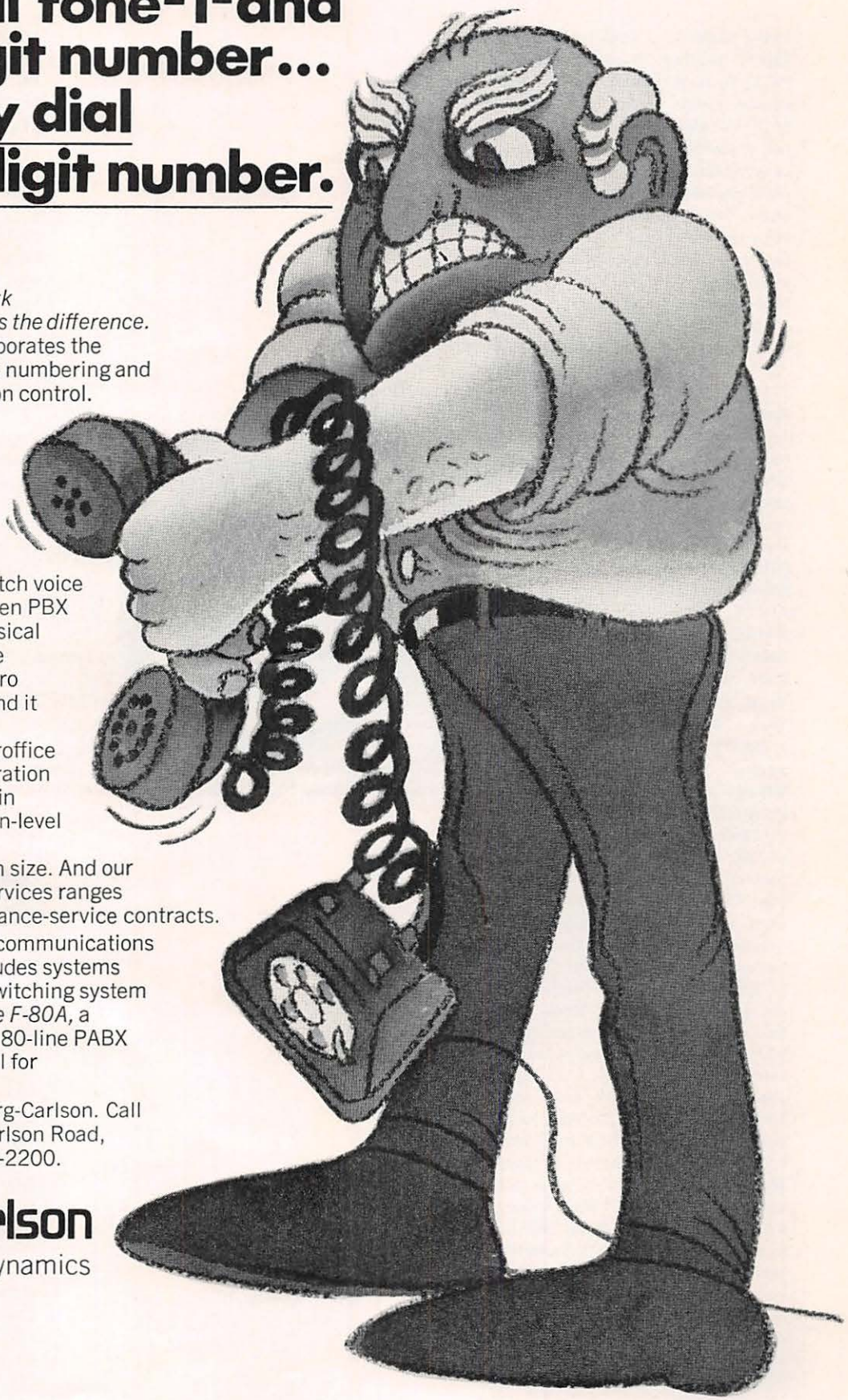
A SUBSIDIARY OF SAFETRAN SYSTEMS CORP.

Main Office and Plant: 4650 MAIN STREET N.E., MINNEAPOLIS, MINN. 55421
Office and Plant: 7615 NATIONAL TURNPIKE, FAIRDALE, KY. 40118

REPRESENTATIVES: Southeastern Railroad Materials Inc., 595 North Avenue N.W., Atlanta, Ga. 30318
IN CANADA: Vale Enterprises, Ltd., 1120 Claire Crescent, Lachine, Quebec
OVERSEAS: Intma International, Inc., 60 East 42nd Street, New York, N. Y. 10017

Circle 31 on reader service card

You can dial 5-wait for dial tone-143-25-wait for dial tone-1-and a seven-digit number... or simply dial the seven digit number.



Stromberg-Carlson 4-wire network communications switching makes the difference. It's a complete system that incorporates the benefits of universal system-wide numbering and alternate routing through common control. So you don't need a directory to determine the routing every time you make a call. Any call is as quick and easy as a local call.

Just as important: transmission quality is vastly improved by eliminating hybrid losses along the line. You can switch voice and data on a no-loss basis between PBX trunk, carrier, microwave, or physical circuits. On top of that, our 4-wire switching system is as close to zero maintenance as you can come. And it proves route restriction, priority preemption, multifrequency interoffice signaling. One- and two-digit operation that allows for 20 or more trunks in one switching stage. Plus common-level "pad" switching.

System capacity is unlimited in size. And our complete spectrum of support services ranges from system planning to maintenance-service contracts.

This applies also to our line of communications switching equipment, which includes systems like: *Type H,* a PABX telephone switching system with unlimited capacity; and *Type F-80A,* a low-cost, hard-working packaged 80-line PABX system that comes ready to install for immediate use.

Get on the track with Stromberg-Carlson. Call or write Railroad Division, 100 Carlson Road, Rochester, N. Y. 14603. 716-482-2200.

Stromberg-Carlson
A Subsidiary of General Dynamics

Circle 15 on reader service card

A QUARTER CENTURY OF SERVICE TO THE NATION'S RAILROADS

Model 1900A Solid State Timer, Model 1350A Rectifier, Model 29A Carrier Phone Terminal Unit, Model 510C dual channel carrier system, Model 900A/901A Hot Box Detector System Verifier, Model 530BT-1 single channel frequency shift carrier, Model 530BT-3 triple channel frequency shift carrier, Model 15CT voice terminal, Model 15CT voice terminal, Model 1200 Line Overlay, Model 601A Full Duplex Heterodyne Repeater, Model 1110B AFTAC, Model 1141B Motion Detector, Model 1110BT/R-2, Model 1176B AFTAC/Motion Detector System, Model 1177B AFTAC/Motion Detector System, Model 1111B AFTAC, Model 1161B AFTAC System, Model 1111BT/R-2, Model 1130A, coupling unit or tuned shunt, Model 1191A line-to-rail coupler for transmitter, Model 1183A Reactor (for Motion Detector on AC coded track) Model 4200 Harmon Frequency Selective Voltmeter, Model 1501A Portable Insulated Joint Checker, Model 51A 117 VAC to 12VDC, 5 amp Power supply, Model 51D 117 VAC to 12V... ...ow voltage cut-out power supply, Model 1A Module Caddy, Model 19A Portable Carrier Phone, Model 1515A HFTAC ...nge track circuit, Model 310A-100 Flashing Light Signal Assembly, Model 310A-401 Flashing Light Signal Asse... ...unit assembly, Model 511C dual channel carrier system, Model 20A band pass filter, Model 530BT-2 dual ... ...odel 531BT/R Supervisory Control Terminal, Model 531BT-3 triple channel frequenc... ...211B FM Modulated Line Overlay, Printed Circuit Board Extensi... ...AFTAC System, Model 1178B AFTAC/Motion Detector ... ...Receiver, Model 1171B FM AFTAC System, Model 117... ...Model 1180A Reactor, Model 1500A Insulated Joint Checke... ...upply, Model 1300A Power Pak, Model 1145B Improved Motion ... ...or, Mo... ...Flashing Light Signal Assembly, Model 310A-400 Flashing Ligh... ...bly, Mod... ...out Can... ...110 Delay Turn Off Unit, Model 180A 550 VAC line coupler, Model 531BT-2 dual chann... ..., Model 610A Dual Channel Heterodyne Repeater, Model 1175B AFTAC System, Model 1130C coupling unit, Model 150... ...oint Checker, Model 51C 117 VAC to 12VDC 4 amp power supply, Model 1500A Stationary Model Insulated Joint Checker, Model 310A-200 Flashing Light Signal Assembly, Model 74A Dragging Equipment Detector DED Module, Model 190A Active band pass filter, Model 530BT/R Supervisory Control Terminal, Model 1181A Reactor (for Motion Detector), Model 50C 117VAC to 12 VDC 2 amp power supply, Model 1515A HFTAC High Frequency, short range track circuit, Model 1700A EOR Solid State Flasher, Model 310A-201 Flashing Light Signal Assembly, Model 1182A Reactor (for Power Supply feeding two Motion Detectors), Model 50D 117 VAC to 12VDC 2 amp with low voltage cut-out power supply, Model 1600A Solid State Grade Crossing Logic, Model 310A-300 Flashing Light Signal Assembly, Model 310A-301 Flashing Light Signal Assembly, Model 1900A Solid State Timer, Model 1350A Rectifier, Model 29A Carrier Phone Terminal Unit, Model 510C dual channel carrier system, Model 900A/901A Hot Box Detector System Verifier, Model 530BT-1 single channel frequency shift carrier, Model 530BT-3 triple channel frequency shift carrier, Model 15CT voice terminal, Model 15CT voice terminal, Model 1200 Line Overlay, Model 601A Full Duplex Heterodyne Repeater, Model 1110B AFTAC, Model 1141B Motion Detector, Model 1179B System, Model 1101BT/R, Model 1110BT/R-2, Model 1176B AFTAC/Motion Detector System, Model 1177B AFTAC/Motion Detector System, Model 1179B System, Model 1101BT/R, Model 1111B AFTAC, Model 1161B AFTAC System, Model 1111BT/R-2, Model 1130A, coupling unit or tuned shunt, Model 1191A line-to-rail coupler for transmitter, Model 1183A Reactor (for Motion Detector on AC coded track) Model 4200 Harmon Frequency Selective Voltmeter, Model 1501A Portable Insulated Joint Checker, Model 51A 117 VAC to 12VDC 5 amp power supply, Model 51D 117 VAC to 12VDC 4 amp with low voltage cut-out power supply, Model 1A Module Caddy, Model 19A Portable Carrier Phone, Model 1515A HFTAC High Frequency, short range track circuit, Model 310A-100 Flashing Light Signal Assembly, Model 310A-401 Flashing Light Signal Assembly, Type 300A Flashing Light unit assembly, Model 511C dual channel carrier system, Model 20A band pass filter, Model 530BT-2 dual channel frequency shift carrier, Model 531BT/R Supervisory Control Terminal, Model 531BT-3 triple channel frequency shift carrier, Model 16CT Portable Voice Carrier Unit, Model 1210B/1211B FM Modulated Line Overlay, Printed Circuit Board Extension Holder, Model 1140B Motion Detector, Model 1100BT/R, Model 1160B AFTAC System, Model 1178B AFTAC/Motion Detector System, Model 1101B AFTAC, Model 1151B FM AFTAC System, Model 1161BR Receiver, Model 1171B FM AFTAC System, Model 1173B System, Model 1130B System, Model 1190A-1 rail-to-line coupler for receiver coupling, Model 1180A Reactor, Model 1500A (less relay) Insulated Joint Checker, Model 51B 117 VAC to 12VDC, 5 amp with

25 Years of Service 1946 1971

HARMON

ELECTRONICS, INC.
GRAIN VALLEY, MO.
PHONE 816-249-3112

Circle 39 on reader service card

SEPTEMBER 1971 VOL. 2 NO. 9

RSC RAILWAY SYSTEM CONTROLS

FEATURED THIS MONTH:

SPECIAL REPORT—
System controls is $3.5 billion market 21

EXHIBIT IN PRINT—
Convention programs and exhibits for Communication & Signal Section, AAR, and Data Systems Division, AAR, annual meetings 25

L&N has extensive hotbox detector system 14

Electrification interference can be reduced 19

DEPARTMENTS:

Books—Tube substitutes; radio fact book 51

Editor's Corner—How to get more from aci 58

News Briefs 50

People 46

Published monthly by Simmons-Boardman Publishing Corporation, 508 Birch St., Bristol, Conn. 06010, with executive office at 350 Broadway, New York, N.Y. 10013. Second class postage paid at Bristol, Conn. 06010 and at additional mailing offices.

Member of the Audit Bureau of Circulations (A.B.C.) Name registered in U.S. Patent Office. Printed in U.S.A. by the Johnson Press, Inc., 800 North Court St., Pontiac, Ill. 61764.

© 1971 Simmons-Boardman Publishing Corporation

Member of RPI RAILWAY PROGRESS INSTITUTE ABC AUDITED PAID CIRCULATION

supporting **ASTRO**

Subscriptions: Address all subscriptions and correspondence concerning them to: Circulation Department, Railway System Controls, P.O. Box 530, Bristol, Conn. 06010. Change of address should reach us three weeks in advance of the next issue date. Send old address with the new, enclosing if possible your address label. The Post Office will not forward copies unless you provide extra postage. Duplicate copies cannot be sent.

Subscription price to railroad employees only in U.S., Possessions, Canada and Mexico, $3.00 one year, $5.00 two years. All others $6.00 one year, $9.00 two years. Payable in advance and postage free. All other countries: $8.00 one year, $16.00 two years. Single copies 75¢.

POSTMASTER SEND FORM 3579 TO P.O. BOX 530, BRISTOL, CONN. 06010.

Editorial Office
29 E. Madison St., Chicago, Ill. 60602

Robert W. McKnight, Editor

Mrs. Grace Rempert, Editorial Assistant

Executive Office
350 Broadway, New York, N.Y. 10013

Robert G. Lewis, Publisher

Fred B. Hecht, Production Manager

Maurice H. Mates, Art Director

John E. Rogers, Director of Circulation

Constance Nicolai,
Manager of Contracts

ADVERTISING SALES:

New York, N.Y. 10013, 350 Broadway, Phone: 212-966-7700. W. Arthur Cubbage, Regional Sales Manager; Charles E. Keil, Regional Sales Manager.

Chicago, Ill. 60602, 29 E. Madison St., Phone: 312-641-5815. C. James Fisher, Vice-President Sales; John M. Brennan, Regional Sales Manager; William J. Lyneis, District Sales Manager.

Pittsburgh, Pa. 15234, 300 Mt. Lebanon Blvd., Phone: 412-341-0844. Ronald M. Giallonardo, Regional Sales Manager.

Dallas, Tex. 75206, Noel Page Building, 6400 North Central Expressway, Phone: 214-361-6972. Joe Sanders, Joe Sanders & Associates.

Los Angeles, Cal. 90025, 11704 Wilshire Blvd., Phone: 213-477-4004. Fred Klaner, Jr.; Philip O. Bowers, The Klaner Co.

Sausalito, Cal. 94965, 3030 Bridgeway Bldg., Phone: 415-332-1481/2. Lewis A. Vogler, Lewis A. Vogler & Co.

London, S.W.1, England, 67/68 Jermyn St., St. James's, Phone: 01-839-6318. Max F. Holsinger; Kenneth J. Hendry.

Manchester 22, England, Haletop, Wythenshawe Civic Center, Phone: 061-437-3293. Ian Goulden.

Paris 8e, France, 70 Rue de Ponthieu, Phone: 359-65-77. Stephen Brown-Joussard; Jean-Claude Lamoine.

4 Dusseldorf-Nord, Eitelstrasse 32, 652031; Erich Hillerbrand; Herbert Haibt; Reinhard Schomburg; William Miller.

Tokyo, Japan, Sun Gain Shia, Ltd., Shiba Nikkatsu Bldg., 13, Shiba Park, Minato-Ku. C. H. Yiu, Managing Director.

YOU ASKED FOR THESE NEW

All of you who have ever used an add-water, throw-away type of carbon battery have asked for:

. . . a positive method of determining when battery capacity is exhausted.

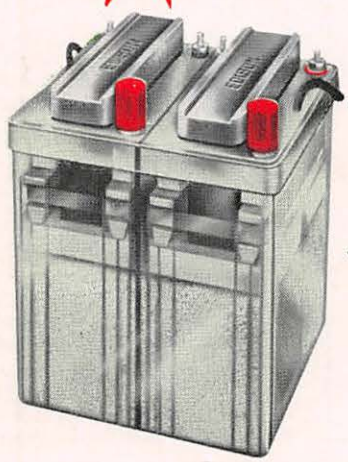
. . . an easy — and accurate — activation procedure.

. . . and many of you have even asked for:

. . . the versatility of external cell connections.

. . . some method of protecting battery carbons against dirt, dust and moisture.

NOW ALL of these features are here in these new Model ST (See Through) Carbonaire batteries



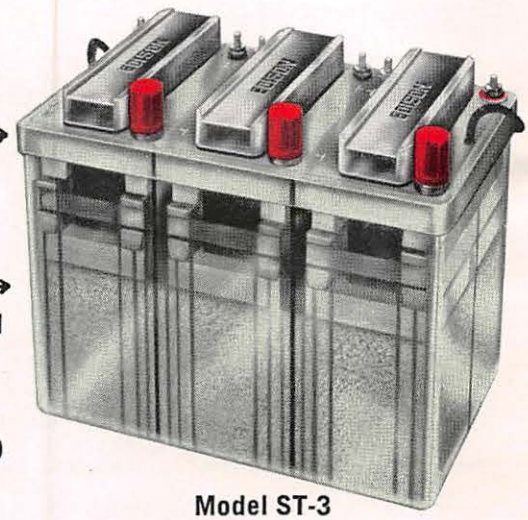
Model ST-2

Connected in series provides:
←1000 a.h. @ 2.5 volts
1000 a.h. @ 3.75 volts→

Connected in parallel provides:
←2000 a.h. @ 1.25 volts
3000 a.h. @ 1.25 volts→

Maximum recommended continuous currents (amperes)

	70°F.	25°F.	0°F.
1000 a.h.	1.25	.750	.500
2000 a.h.	2.50	1.50	1.00
3000 a.h.	3.75	2.25	1.50



Model ST-3

Obviously, we can't answer all your questions on these new

Al Frank

Ed Rowland

Al Cary

Bob Doyle

B.R."Whitey" Merta

Bill Huntenburg

Ray Thomas
Decatur, Ga.
404/634-8004

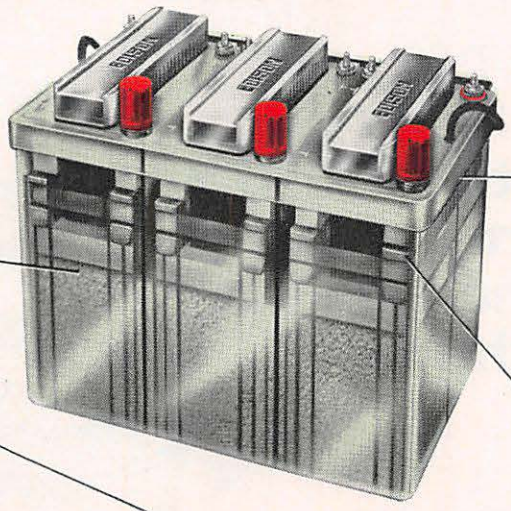
Charley Quinn
Pittsburgh, Pa.
412/366-2043

HOME OFFICE, BLOOMFIELD, N. J. 201/751-3700

. . . or you can write EDISON BATTERY DIVISION --

EDISON *Carbonaire*® BATTERIES

"See through" case and cover made of transparent Acrylite MP — one of the toughest of the "modern age" plastics (and the same material used for our nickel-cadmium storage battery cases and covers).

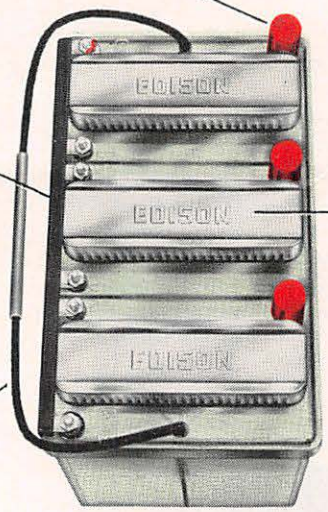


You can **watch** the activating water reach its proper level — and stop when it does. No more over-filling or under-filling. No guessing, no gauges, no dip-sticks.

By **visually** checking the amount of zinc left in the battery, you can be **certain** when it is ready for renewal.

Screw type filler caps permit transportation of activated batteries without danger of electrolyte spillage.

External bus bar permits connection of individual cells either in series or parallel. A multi-purpose feature that cuts by **one-half** the type of batteries you may normally need to stock. (Illustration shows parallel connection on battery.)



This cover stays over each carbon throughout the battery life. Inside, this protector is lined with a special material which filters out dust and dirt while still permitting the necessary air to flow over the carbons. No condensation or dripping water can fall on the carbons. Another "giant step" forward in assuring full capacity from every battery even when installed under adverse environmental conditions.

Rugged, built-in carrying handle.

batteries in this one ad, but we do have these people who can –

Dick Chamberlain

Pete Salerno

John Burton

Jack Swiss

CHICAGO OFFICE 312/427-4986

Jim Greer

Bob Rodden

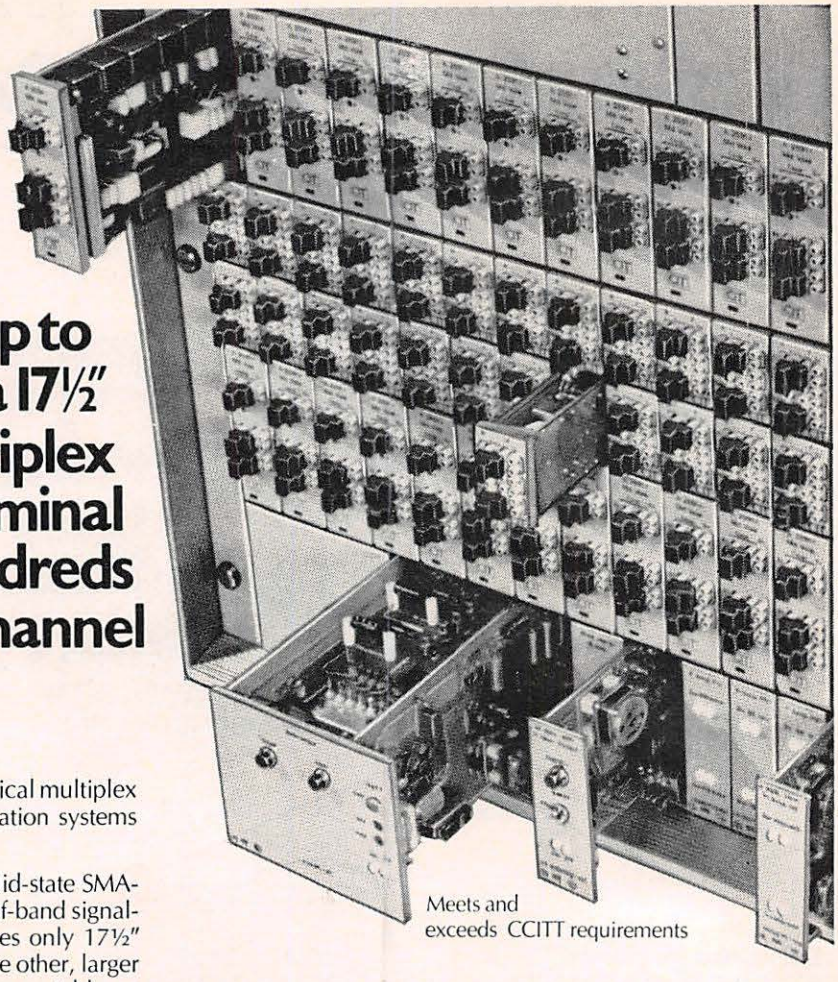
ST. LOUIS OFFICE 314/231-3930

J.A."Skee" Kalczynski
Gretna, La.
504/367-4201

McGraw-Edison Company, P.O. Box 28, Bloomfield, N.J. 07003

Circle 7 on reader service card

Pack up to 24 channels in a 17½" standard multiplex terminal and save hundreds of dollars per channel



Meets and exceeds CCITT requirements

This new CCS Type SMA-7/24 is the most economical multiplex terminal you can buy for low-density communication systems or low channel drop at intermediate stations.

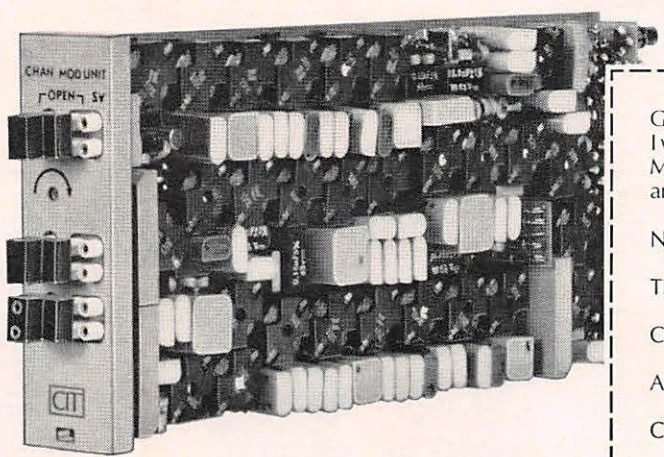
Smaller than its competition, the complete, all-solid-state SMA-7/24 package incorporates 24 channels with out-of-band signaling in 10 standard mounting spaces and measures only 17½" high. It occupies little floor space, fits neatly where other, larger units can't be used, or mounts conveniently on a table or counter top.

Operating in the 12 to 108 kHz range, the SMA-7/24 is a frequency division multiplex system specially designed to meet the requirements of through-route systems. It is compatible with microwave, troposcatter and hard wire systems used in telephone company, railroad, pipe-line and other "right-of-way" communications.

Compact packaging and low cost make the SMA-7/24 terminal particularly valuable for microwave stations which need only a few channels.

The SMA-7/24 unit features identical and interchangeable channel modems. Which means you reduce spares-storage, service and replacement problems. (Stock only one extra module for emergencies.) Since all units are plug-in modules, an SMA-7/24 terminal initially equipped with less than 24 channels can be expanded to full capacity at any time, quickly, easily, economically. You buy only the channels you need.

Learn how the SMA-7/24 multiplex terminal can make your multiplexing operation more efficient . . . more economical. Write for our latest brochure. Or call (212) 757-9130 ext. 37.



One duplex channel with out-of-band signaling is on a single plug-in module only 3½" high

Gentlemen:
I would like to know more about the CCS Type SMA-7/24 Multiplex Terminal. Please send complete technical description and specifications.

Name_____

Title_____

Company_____

Address_____

City_____ State_____ Zip_____

CABLE COMMUNICATION SYSTEMS, INC., 50 Rockefeller Plaza, New York, N.Y. 10020

U.S. Affiliate of Compagnie Industrielle des Télécommunication CIT-ALCATEL – Paris – France

Circle 8 on reader service card

Why YOU should try the Frequency-Shift Overlay Track Circuit.

It's an entirely new concept in overlay track circuits, and it really gets results. New, super-selective tuned circuits and new receiver techniques (patent pending) pull a strong, clean signal out of noise and interference conditions once thought impossible. Where conditions are worse than bad, you can beef up the transmitter with an optional power amplifier – and slam the signal through with a hefty four watts. Power line interference is no longer a problem. All fifteen frequency channels are selected to be clear of harmonics of any currently-used power frequencies, and are mutually compatible with one another. Frequency determining elements plug in. A transmitter or receiver can be changed from one channel to another in minutes.

Centralized equipment installations are easy with FSO. The transmitter can be 3000 feet from the track connection, and the receiver can be 6000 feet from the track connection. At low frequencies, track circuits can be as long as 6000 feet.

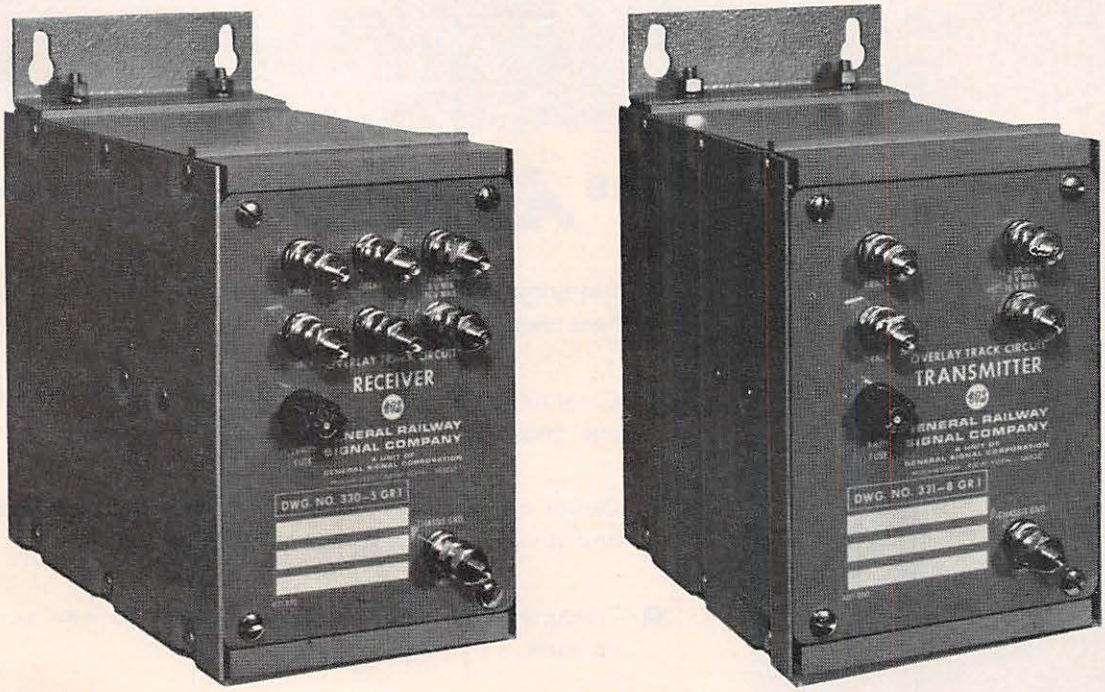
Want to know more? Ask for Catalog 92-2.

GENERAL RAILWAY SIGNAL COMPANY

A UNIT OF GENERAL SIGNAL CORPORATION

ROCHESTER NEW YORK 14602

ATLANTA BOSTON CHICAGO MONTREAL NEW YORK OAKLAND ST LOUIS ST PAUL



3525

FSO FSO FSO FSO FSO FSO

Circle 9 on reader service card

GET THE BRUSH OUT...

...OF YOUR LINES...

the KERSHAW BRUSH CUTTER

- Designed to cut brush under your communications lines over the roughest terrain.
- Constant cutter RPM and variable propelling speed with one engine made possible by use of hydrostatic drive.
- Center articulation and oscillation provides maneuverability and ground contact over rough terrain.
- Transportable over the highway under its own power or on truck.

KERSHAW MANUFACTURING CO., INC.
P.O. BOX 9328 ■ MONTGOMERY, ALABAMA 36108 ■ U.S.A.

KERSHAW MANUFACTURING CANADA LTD.
385 BRIDGE STREET ■ MONTREAL QUEBEC, CANADA

Circle 10 on reader service card

50% OFF THE REGULAR ONE YEAR RATE

A FULL YEAR OF
RAILWAY SYSTEM CONTROLS
PUBLISHED MONTHLY
FOR ONLY $1.50
THE REGULAR RATE IS $3.00
YOU SAVE HALF!

OR . . . YOU MAY PREFER:

Two years, only $3.00 **Three years, only $4.50**

This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Now you and your associates may personally subscribe to RAILWAY SYSTEM CONTROLS either at home or office.

You know how important it is that the "new crop" of men in your department be familiar with RAILWAY SYSTEM CONTROLS. That is because this magazine is the best source of information about their work. It sharpens their skills by informing them how men on other roads tackle and lick the same problems which beset them.

Money-back guarantee: if not satisfied, a no questions asked prompt refund will be sent for all unmailed copies.

If you are a reader-and not a subscriber-fill out the card and mail it today!

50% OFF THE REGULAR ONE YEAR RATE

☐ YES, I want
RAILWAY SYSTEM CONTROLS
(published each month)

Enter my new personal subscription for a full year (12 Issues) at only $1.50. The regular subscription price is $3.00—I save half!

☐ Two years $3.00 ☐ Payment herewith
☐ Three years $4.50 ☐ Bill me

Name_____

Address ☐ Business
☐ Home

City, State, Zip_____

Railroad_____

Department_____

Job or title_____

This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Postage Will be Paid by Addressee

BUSINESS REPLY MAIL

First Class Permit No. 153, New York, N.Y. 10013

RAILWAY SYSTEM CONTROLS

P.O. Box 530

Bristol, Conn. 06010

No Postage Stamp Necessary If Mailed in the United States

50% OFF THE REGULAR ONE YEAR RATE

A FULL YEAR OF
RAILWAY SYSTEM CONTROLS
PUBLISHED MONTHLY
FOR ONLY $1.50
THE REGULAR RATE IS $3.00
YOU SAVE HALF!

OR . . . YOU MAY PREFER:

Two years, only $3.00 **Three years, only $4.50**

This SPECIAL INTRODUCTORY OFFER is limited to new individual subscribers who are employed by a railroad or a rail rapid-transit system in the U.S., possessions, Canada and Mexico.

Now you and your associates may personally subscribe to RAILWAY SYSTEM CONTROLS either at home or office.

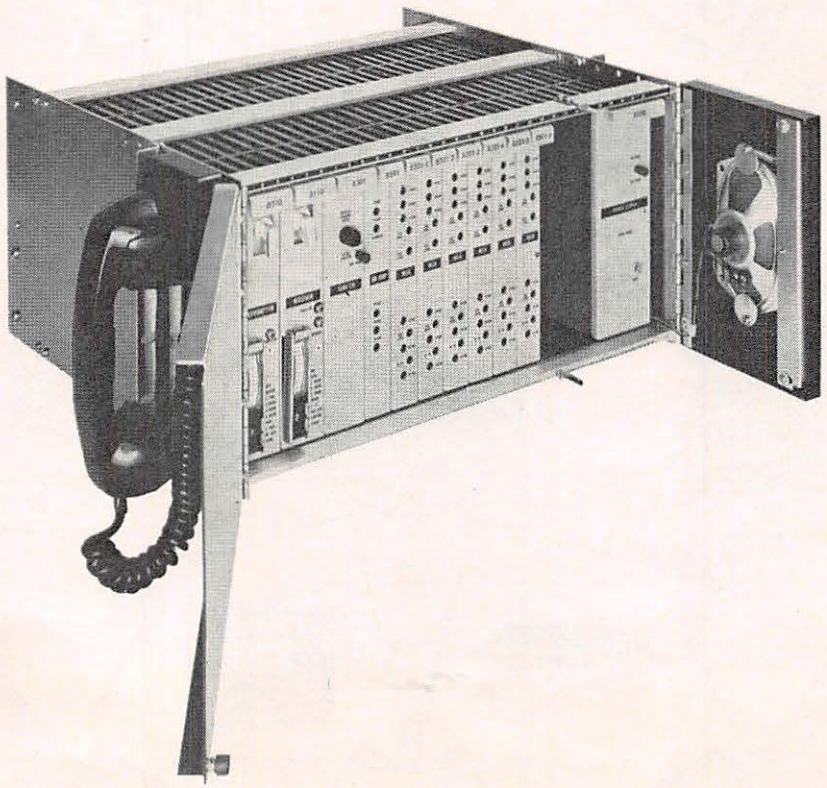
You know how important it is that the "new crop" of men in your department be familiar with RAILWAY SYSTEM CONTROLS. That is because this magazine is the best source of information about their work. It sharpens their skills by informing them how men on other roads tackle and lick the same problems which beset them.

Money-back guarantee: if not satisfied, a no questions asked prompt refund will be sent for all unmailed copies.

If you are a reader-and not a subscriber-fill out the card and mail it today!

NEW system 8000

960 MHz FOR REMOTE CONTROL



The first of the NEW Cardion system 8000 is for use in the "operational fixed" band of 952 to 960 MHz. Under FCC Rules, 32 frequency pairs, for full duplex operation, are available for point-to-point remote control of base stations, 4 pairs for omnidirectional use, and 6 non-paired frequencies for omnidirectional use. (This band is **not** being considered for new mobile frequencies.) The "960" channels are shared among 5 Radio Services: Land Maritime, Aviation, Public Safety, Industrial, and Land Transportation.

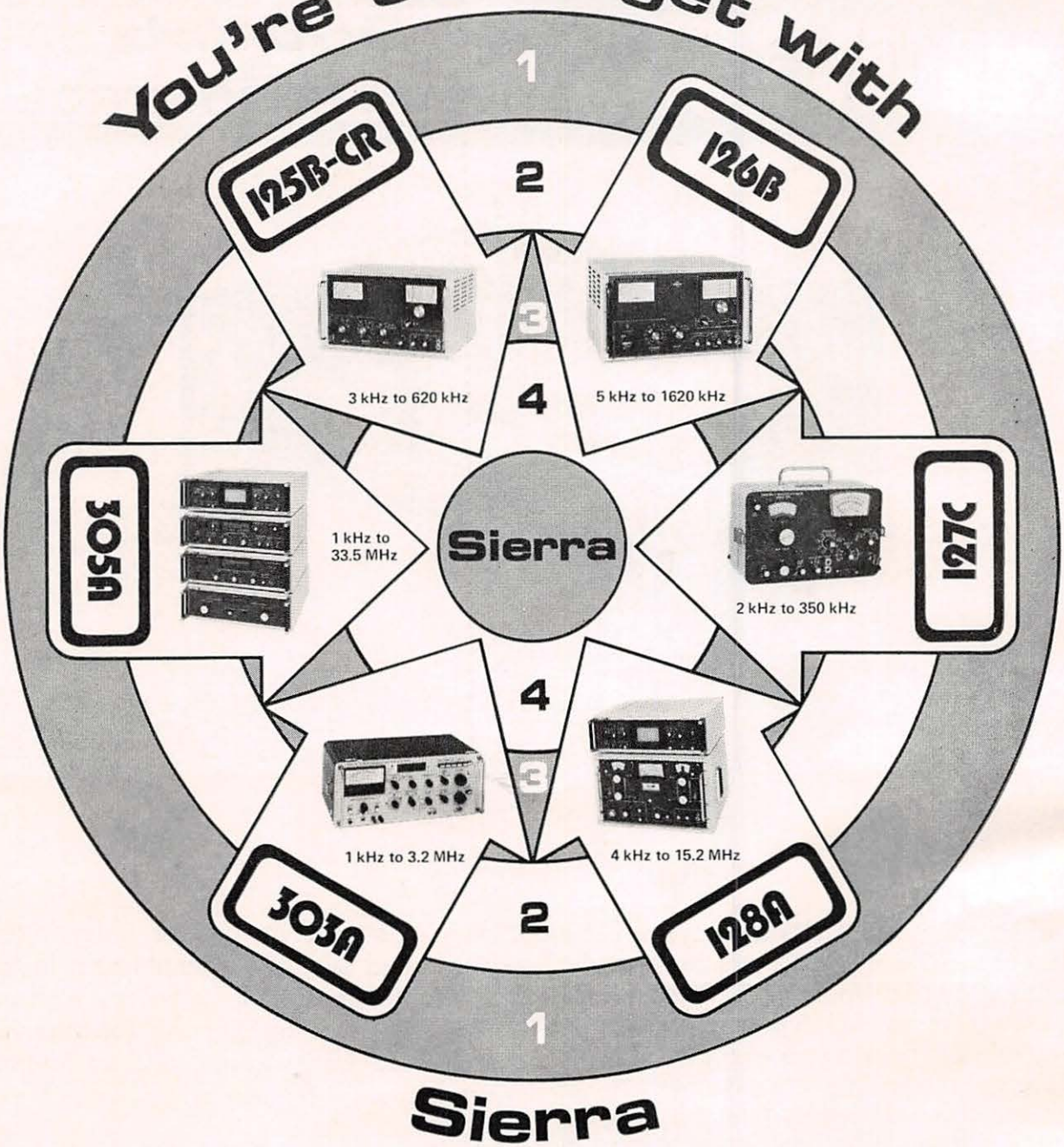
"Operational-Fixed" mainly means remote control of two-way radio base stations. Because the 960 Cardion system 8000 has multiplex capability, up to **six** base stations, send and receive, can be independently controlled over one channel pair. In some Radio Services, multiple tones may be carried on the voice channels for other control, data transmission, and/or telemetry purposes.

Cardion's new all solid-state system 8000, designed on the building-block principle, enables the user to start with simple, low-cost, basic single-channel terminals. Expansion to multi-channel capability is easy. Only those units actually required need be added. Cost is minimized because all units added are powered from the regulated supply provided with the basic terminal.

Cardion ELECTRONICS • COMMUNICATIONS DEPARTMENT
A UNIT OF GENERAL SIGNAL CORPORATION
LONG ISLAND EXPRESSWAY WOODBURY N.Y. 11797 U.S.A. TWX 510-221-2179 516-921-7300

Circle 11 on reader service card

You're on target with



Sierra

Selecting the right frequency selective levelmeter requires more than just throwing darts. You need quality. And Sierra is the proven quality leader. We also offer a complete line of levelmeters. There's one on target for your needs.

Contact your nearest Sierra Regional Manager . . . he'll be glad to help.
P. S. Also, he'll give you a free dartboard including darts.

Dave Dunn, P. O. Box 265, Littleton, Massachusetts 01460 (617) 369-1059
Donald C. Buscher, 11 Caledonia Drive, Warminster, Pennyslvania 18974 (215) 675-4700
Pat Luczak, 142 Longwood Drive, LaPorte, Indiana 46350 (219) 362-5925
Billy Williams, P. O. Box 157, Clarkston, Georgia 30021 (404) 443-4778
Bob Wylie, 9009 Sirocka Drive, Ft. Worth, Texas 76116 (817) 244-6091
Keath Cowell, (Comm-Well), Route 5, Box 761, Golden, Colorado 80401 (303) 277-0807
Dallas Gill, 3885 Bohannon Drive, Menlo Park, California 94025 (415) 322-7222

For additional information write or call:
Sierra Electronic Operation • 3885 Bohannon Drive
Menlo Park, California 94025 • (415) 322-7222/TWX 910-373-1282

PHILCO Ford

Sierra manufactures a complete line of transmission, data and RF instruments for the communications industry.

Circle 12 on reader service card

Circle 13 on reader service card

NIFE ON THE ILLINOIS CENTRAL

NIFE nickel cadmium battery reliability now serves the Illinois Central.

For automatic highway crossing protection, classification yard control, track circuits, automatic block signals.

And when Illinois Central recently relocated five control machines to Chicago Headquarters for improved central dispatching, NIFE batteries were specified for this severe around-the-clock service.

NIFE's full line of RP and RS railway signaling batteries includes sizes to 407 ampere-hour capacities in plastic containers, and even larger in steel. For railroad applications requiring high-discharge currents, such as for car retarders and stationary engine cranking, NIFE cell types HIP/HI and MDP/MD are available in a variety of ampere-hour capacities.

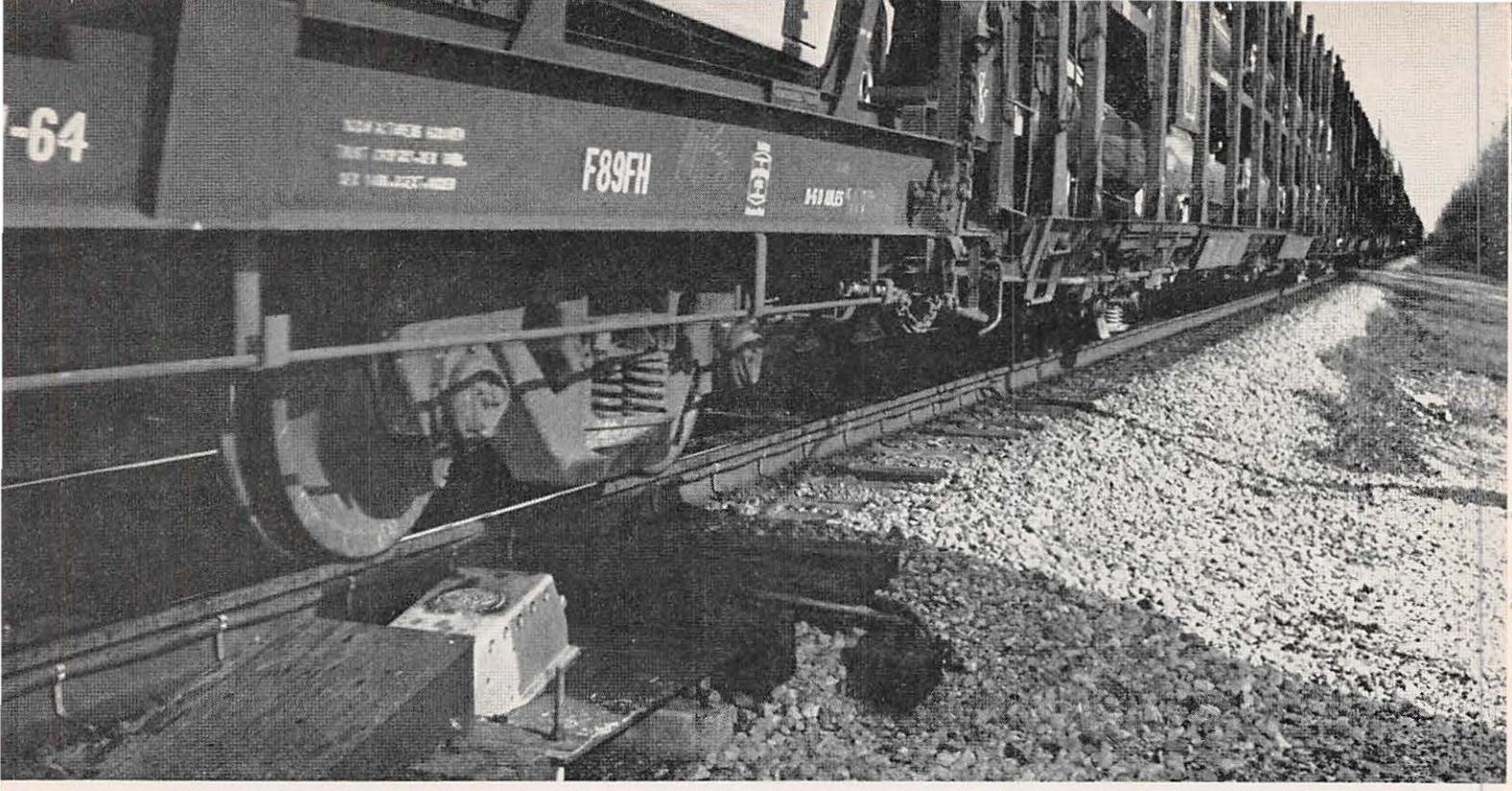
NIFE also manufactures solid-state battery chargers and battery/charger consoles for special applications.

Ask for your copy of NIFE's railway-battery catalog.

NIFE 32-volt RP-166 CTC battery installed at ICRR Headquarters.

NIFE®

NIFE Incorporated
Copiague, Long Island, New York 11726
Telephone: 516-691-3240
Marketed in Canada as **JUNGNER** batteries by Cipel & LeCarbone, Ltd.



L&N has extensive hotbox detector

MANAGEMENT INFORMATION

Last year, Louisville & Nashville's hotbox scanners detected and reported over 400 overheated journals. L&N now has 52 hotbox detectors strategically located along mainlines and on other lines handling heavy traffic density, such as coal. The aim of this hotbox detector program, says an L&N spokesman, is to detect more and more overheated journals before they can cause serious trouble. The real payoff then comes in reduced loss and damage claims, and in greater safety for lading, equipment and people.

To more promptly alert train crews of hotbox detector actuation, L&N has installed digital display boards at some hotbox detector sites. This provides an instantaneous visual report to train crews when the detector spots an overheated journal. Digital readout shows the location of the hotbox from the rear of the train, and a flashing-white light tells which side of the train has the hotbox.

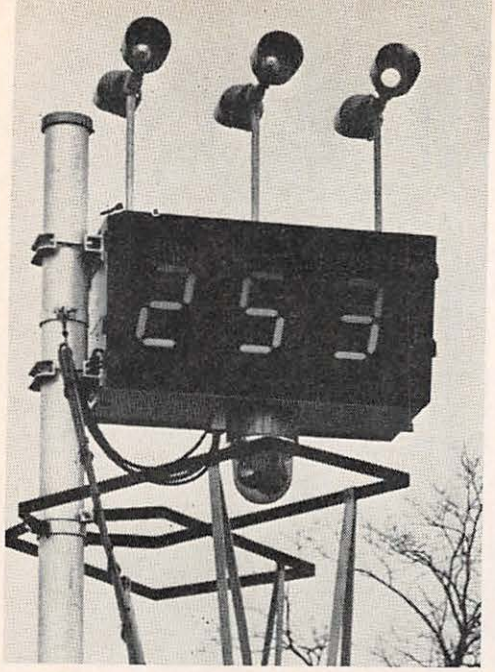
An additional safety feature is that immediately after passage of the train an integrity check is made of the operation of the detector system. If for any reason, the system fails this integrity check, a flashing-blue beacon is lighted at the detector site to alert the train crew to stop the train and make an on-the-ground inspection of the cars.

Louisville & Nashville has 52 hotbox detectors strategically located around its system watching for overheated journals. Eight new Servo Corp. model 8808 rail-mounted detectors are in this year's program for expanding the overheated journal surveillance system. Presently, L&N has 52 Servo detectors and one Railtron detector.

Recently L&N provided a new look in hardware to more promptly alert train crews of detector actuation. A digital display board is located at the hotbox detector site along with white alarm lights and a flashing-blue beacon. The digital display will indicate the exact location of a suspected hotbox, if any, and can indicate no hotboxes found. Operation is as follows:

When a train approaches the hotbox detector, the engineer so informs the the rear end crew by radio. The rear end crew will observe the digital display and alarm lights, which will remain lighted for 90 seconds after the last car passes the detector. If no hotboxes have been detected, the board reads "000." Crew members on the caboose radio the engineer that the train has been inspected and that no hotboxes were found.

If the detector is actuated by an overheated journal, then one or more of the alarm lights will start flashing, and the digital display will indicate the number of axles from the first hotbox



DIGITAL DISPLAY BOARD indicates location of overheated journal found by hotbox detector. Display is at detector site.

system

to the end of the train. In the example shown in the photograph above, the suspected hotbox is on the 253rd axle from the rear of the train (probably on the rear axle of the trailing truck of the 64th car from the rear.) The upper right alarm light indicates that the hotbox is on the east side of the train.

The rear end crew radios the engineer to stop the train for inspection. If they find no hotbox on the suspect car, they will also inspect two cars each side of the indicated one, and fill out the appropriate form (see diagram). They will also inform the dispatcher of their action.

If the center alarm light is flashing—or if all three alarm lights are on—the detector has spotted more than one hotbox. The digits displayed, however, are for the location of the first hotbox detected. To locate the others, the train crew must stop the train and inspect each side, from the first hotbox indicated to the rear of the train.

To assure that the hotbox detector system is operating properly, an integrity check is made immediately after the passage of each train utilizing a failure indicator unit. The electronic gate is automatically opened as heated shutters close. The signal derived from this heat must be of a predetermined value because if it is not, then a failure indication is initiated. The flashing-blue beacon is lighted which alerts the crew to stop the train for manual on-the-ground inspection. Also, should no indication of any kind—display-board digits, alarm lights or blue failure beacon—appear, crewmen must stop the train immediately for inspection of all cars.

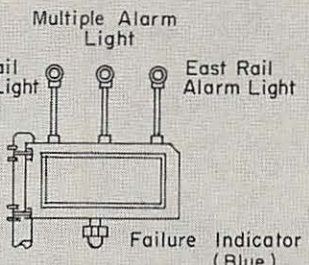
In centralized traffic control territory, dispatchers are alerted to overheated journals. As soon as a detector is actuated, an indication is transmitted to the ctc control machine where visual and audible indicators so inform the dispatcher. On non-ctc equipped lines, L&N's signal department is in the process of installing a system which will indicate to train dispatchers hotboxes detected in their territories by a tone which will sound on their communications circuit.

Recorder charts are used at the detectors sites of all automatic detectors—display boards or indicator lamp units

DISPLAY BOARD HOT BOX DETECTOR

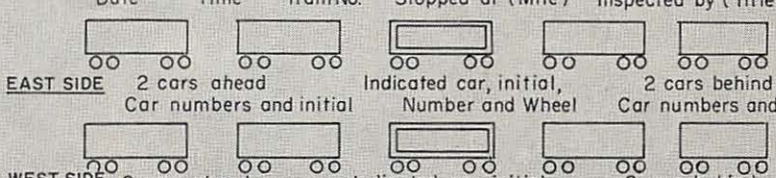
HOT BOX DETECTOR LOCATED AT MILES (Circle one) 36 – 62 – 89 – 118 – 146

Trainman on the caboose will place an "X" on the lamps that are burning and fill in the wheel count information as shown by the Display Board.

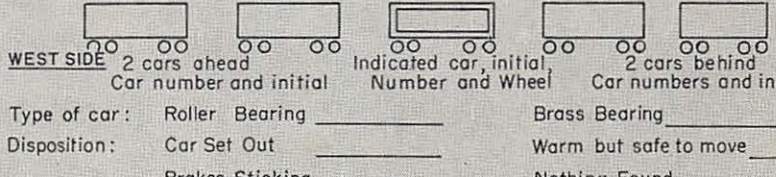


REPORT OF INSPECTION

Date Time Train No. Stopped at (Mile) Inspected by (Title)



EAST SIDE 2 cars ahead Car numbers and initial | Indicated car, initial, Number and Wheel | 2 cars behind Car numbers and initial



WEST SIDE 2 cars ahead Car number and initial | Indicated car, initial, Number and Wheel | 2 cars behind Car numbers and initial

Type of car: Roller Bearing _____ Brass Bearing _____

Disposition: Car Set Out _____ Warm but safe to move _____

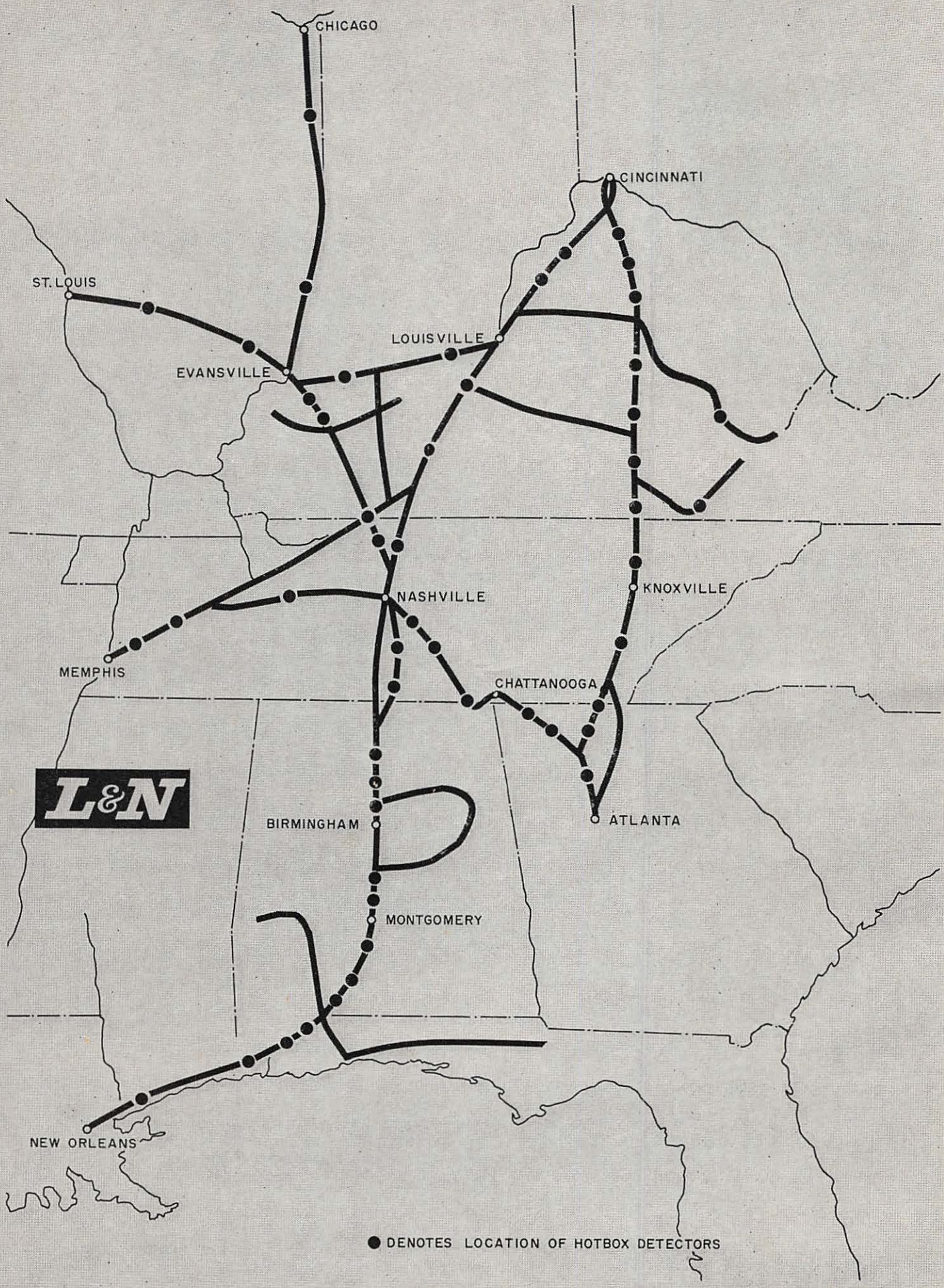
Brakes Sticking _____ Nothing Found _____

Red Hot Box Tag placed on indicated journal _____

Information transmitted to Dispatcher at _____

All required information must be shown on this form. This form must be mailed to the Assistant Superintendent upon arrival at terminal.

REPORT FORM is filled out by trainmen following detector actuation.


CHICAGO
CINCINNATI
ST. LOUIS
LOUISVILLE
EVANSVILLE
NASHVILLE
KNOXVILLE
MEMPHIS
CHATTANOOGA
L&N
BIRMINGHAM
ATLANTA
MONTGOMERY
NEW ORLEANS
● DENOTES LOCATION OF HOTBOX DETECTORS

on block signals alert train crews. Manually read detectors have recorders in a dispatcher or operator's office where they will interpret and evaluate the recordings.

For some line-of-road hotbox detectors L&N uses automatic approach and hotbox stop indicators which are illuminated when a hotbox has been detected. With these older installations, a flashing-white approach indicator is located on a block signal mast about three miles beyond the hotbox detector. If the detector spots a hotbox on a passing train, the approach indicator begins flashing. This tells the engineer that a hotbox has been detected and that he should approach the next signal prepared to stop. At this signal, another two miles or so down the line, an indicator (on the signal mast) will be illuminated to show the words "HOT BOX" in white on a black background. The train should stop at the signal (not beyond it), and the crew will go to a wayside housing containing digital readout units. In this hotbox locator bungalow the crewman will record the number or numbers registered on the panel in the proper block or blocks on a mimeograph form (see page 18).

The indication registered on the panel will be the number of journals from the hotbox to the rear of the train, including caboose, but not including the hot journal. The hotbox locator panel has two horizontal rows of register units, one row for each side of the train and identified as east and west rail. Hotbox journal locations will be registered in succession from left to right. The number indicated in the left register unit (block 1 on the form) for east or west side, will be the first hotbox detected on that side of the train. Each succeeding indication will indicate a hotbox south of the hotbox preceding it.

The car or cars indicated having hot journals must be thoroughly inspected and if a hot journal is not found at the location registered, the crew must inspect two cars immediately ahead and behind the car registering a hot journal. After inspection, the crew advises the dispatcher of the initial and number of car or cars registered together with information as to the condition found, stating whether the journal was serviced or the car set out. The information sent to the dispatcher (including the above) will be the applicable items checked on the form.

CHECK SHEET FOR HOT BOX DETECTOR

LOCATION **DIVISION** **DATE** **YES** **NO**

Rail tamped tight 300 ft each side of scanners
Anti Rail creepers installed 3 rail each side of scanners
Rail gauge tight (install gauge rods if necessary)

TRANSDUCERS tight on rail

Properly adjusted
Damaged by dragging equipment
Junction Box properly secured to foundation
Junction Box Cable Connectors tight
Junction Box Clean and terminals tight

SCANNERS

Properly Aligned
Housings properly painted
Cable connectors tight
Heaters and Thermostats operating properly
Heater and Thermostat secure and terminals tight
Housing plugs in use (seasonal)
Sensor Jct Box connections tight
Lens cap clean
Lens clean and undamaged
Shutter mechanism free of obstructions and lubricated with dry lubricant

DATA PROCESSING UNIT

Mounting hardware secure
Cable connectors tight
Modules screwdriver tight
Check Monitor for tight connections
Check Alarm Computor for tight connections
Firing Level of Monitor Found_____ Left_____
Firing Level of Alarm Computer Found_____ Left_____
Check Failure Indicator for Proper Operation
Check Failure Indicator for tight connections

RECORDER

Fuses proper size and tight
Cable connections tight
Stylii clean
Proper pressure on stylii
Terminals connections tight
Gears properly lubricated

APPEARANCE OF GRAPHIC RECORDING

Recorder shows proper gating
Recorder shows proper balance
Any indication of unusual occurrence (Explain)
Check Locator for correct operation of all Counters & reset
All lightning arrestors clean and adjusted
Equipment properly grounded

VOLTAGE CHECKS

Check Battery and record readings Voltage Found _____
Charge Found _____
Charge Left _____

Line Voltage Regulator 118v ± 1%
Stabilized Main Power Supply 300v ± 5%
Pre-Amp Voltage Ref. 170 ± 10%
Reference Voltage Standard +175 −175 ± 10%
with artificial load and sensor cables disconnected
All plans for related equipment available
List any unusual operation of this Detector

SUBJECT: HOT BOX DETECTOR

Date _____ Time _____ Train No. _____

EAST RAIL

1	2	3	4
Car Initial & Number	Car Initial & Number	Car Initial & Number	Car Initial & Number

WEST RAIL

1	2	3	4
Car Initial & Number	Car Initial & Number	Car Initial & Number	Car Initial & Number

A Member of the Crew will check ( ) Applicable Items listed Below:

HOT BOX

A. ( ) 1. Roller Bearing Car ( ) 2. Waste Packing ( ) 3. Pad Lubricator

B. ( ) 1. Journal Repacked ( ) 2. Journal Rebrassed ( ) 3. Journal Lubricated
( ) 4. Coolant Applied ( ) 5. Car Set Out ( ) 6. Car Warm But Safe to Move
( ) 7. Nothing Found ( ) 8. Call Light Burning

BRAKES STICKING

C. ( ) 1. Brakes Sticking ( ) 2. Brakes Cut Out

_____
Signature of Crew Member

REPORT FORM used by crew at detectors with digital locator panels.

If the crew sets a car out because of a hotbox, a red tag is attached by wire to the journal. On one side of the tag are the words "HOTBOX—This box has been detected as being overheated by detector at___. Car inspector examine." On the reverse side, the train conductor fills in the following: "Station___, Date___, Car initial___, Car Number___, Train Number___, Conductor___."

Train stopping criteria for the L&N is a 9 mm differential reading between ends of the same axle, or a 15 mm absolute reading.

As mentioned before, graph recordings are made by all hotbox detectors. These graphs, together with written hotbox reports by train crews and dispatchers, are sent to division headquarters, and then to the signal department in Louisville, where a system-wide tabulation of hotbox detector performance is kept. The performance report contains the following information: Location, Number of Cars Reported by the Detector, Follow Up Action by Crew and Terminal inspection (Repaired or Set Out on Line of Road, Defect Found at Terminal, No Defect Found at Terminal, No Report from Terminal), PerCent Efficiency of Hotbox Equipment and PerCent Efficiency of Terminal Inspection.

To insure that L&N is obtaining maximum benefits from its hotbox detector system, Jack P. Powell, superintendent of signals-system, has appointed James T. Brown, signal supervisor-electronic, and Victor R. Stansberry, signal inspector-electronic, to supervise this vital and expanding program. With headquarters in Louisville, these men and their staff members have system-wide responsibility for implementing the new detectors and coordinating these projects with division engineers and signal forces.

Part of their functions is to plan for future detector installations. Factors determining location of detectors include number of journal failures on a given segment of track, density of traffic, etc. Engineering, transportation and mechanical departments merge their recommendations in order to arrive at general locations for detectors to be installed. Specifically, exact detector locations are based on tangent track, 1,000 ft minimum on approaches to detectors, minimum grade where normally no braking should occur, and available set-out facilities near or at the readout or inspection point.

Extensive divisional training programs are now under way for briefing signal maintainers on features of the new Servo model 8808 detectors, and upgraded detectors with digital display boards. Signalmen attend classes on L&N where Servo Corp. instructors describe operation of the 8808 detector, and cover maintenance procedures to be followed. Each division has its own maintenance schedule which is dependent upon detector locations, work load, etc. A maintenance check sheet for hotbox detectors is used and a log is kept at each detector location indicating what maintenance has been performed.

L&N's upgrading program is to convert single-direction detectors to bi-directional units. Also many are now being equipped with the digital display boards. The new and upgraded detectors concentrate at one location all equipment formerly scattered at several places and over as much as 10 miles (in the case of bi-directional detectors, with carrier lines to approach signals, remote readouts and bungalows on either side of the detector). Now, with all detection equipment at one location, maintenance is greatly reduced, as are any errors of data transmission to remote readouts or approach signals.

Recently completed is installation of new and upgraded detectors on the Cincinnati-Atlanta main line. Through trains are inspected 13 times by hotbox detectors on the 471-mile route, with detector spacing averaging 25 to 35 miles. During this year, 8 new model 8808 detectors and 13 upgraded units will be installed around the system.

Editor's Note: Sincere thanks are extended to Charles B. Castner, contributing editor, and William C. Tayse, photographer, L&N Magazine, and Jack P. Powell, superintendent signals-system, for their help in supplying information and pictures for this article.

Electrification has good potential

High density traffic lines may be electrified. Problems of inductive interference are being overcome in many countries.

Interest continues high, relatively speaking, for electrifying railroads in the U.S. and Canada. Of the world's 144,930 track miles of electrification, the U.S. accounts for 2,856 and Canada for 48. CP Rail, for one, is vitally interested in electrifying 850 miles of mainline from Calgary, Alta. to Vancouver, B.C. and from Golden to Sparwood, B.C. CP Rail would construct a 50 kv 60 Hz ac system, that "would offer operating advantages enabling operation up the controlling grades at higher speed and also would enable a faster movement of trains from a stop in sidings or at other points and therefore would tend to increase capacity," says S. M. Gossage, senior executive officer. CP Rail is predicting a doubling of bulk traffic over its Rocky Mountain lines during this decade.

Meanwhile, in the U.S., the 15-mile completely automated Muskingum Electric has been in operation since 1969. This coal hauling railroad operates on 25 kv, 60 Hz traction power. Another coal-hauling automated railway project has been recently announced which will use 50 kv, 60 Hz traction power. The new 80-mile line, known as the Black Mesa & Lake Powell, will haul coal to a generating station near Page, Ariz. The 2.31 million kw facility, known as the Salt River Project, is a joint venture of four power companies and the U.S. Bureau of Reclamation.

While most other electrification projects in the U.S. and Canada recently constructed, in planning or construction stages are rapid transit lines—Toronto, New York, San Francisco and Washington—there are compelling reasons for the favorable attitude towards mainline electrification. "Economic, strategic and ecological circumstances demonstrate an urgent need to convert the mainline base load rail routes of the U.S. to electrified systems at the earliest date," states Donald R. Austin, staff engineer, Reading, at the joint American Society of Civil Engineers-American Society of Mechanical Engineers, Transportation Engineering Meeting, at Seattle, Wash., July 26-30.

One economic factor favoring electrification is the rising cost of diesel oil compared to a generally steady price for electric power. "Power generating authorities generally agree that an average 'across the Nation' bulk power cost figure is approximately one cent per kwh. This is roughly equivalent to a 12.5 cent gallon of diesel oil. One eastern state railroad reports that their 1970 fuel oil costs averaged 10.9¢ per gallon. When the costs of handling into tanks was added, this figure rose to 13¢.

"Since that date Middle East oil costs have risen from $2.55 per barrel to $3.45 per barrel, an increase that will bring the foreseeable 'in tank' oil cost to approximately 17.6¢ per gallon. Regardless of agreements, oil is now moving upwards in cost, and with the steadily increasing world demand, it is inevitable that by 1980 it is likely to be priced out of the rail transportation field for long distance main line traffic," Austin said.

Routes for possible conversion to electrification, have generally been agreed to as heavy traffic main lines. Estimates for conversion to electrified territory have run to as much as 20% of the U.S. mainline routes. "One of the accepted criteria by railroad engineers is that when the route traffic density reaches 30 million gross ton miles per mile of proposed electrification, the economics are such as to warrant conversion. Another accepted criteria is the relation of operating horsepower on the track to be converted to its length. This formula sets the break-even point at a density of 1,000 hp, or more, per mile of track to be converted," Austin said.

Environmental control vital

Another factor in favor of electrification is that of environmental control, or today's popular word—ecology. "If the standards of pollution laid down for the automobile industry were to be applied to diesel-electric locomotives, they would all have to be withdrawn from service. Diesel-electric locomotives cannot, with the present levels of scientific knowledge, be manufactured to meet the pollution standards set," reports Dr. W. T. Harris, vice-president research and test department, AAR.

One of the side effects of ac electrification—the above discussion has been about electrifying with commercial frequency ac, probably 25 kv or 50 kv at 60 Hz—is the degree of the interference phenomenon to unprotected signaling and communications circuits. Railroads throughout the world have found means and measures to control these side effects efficiently and economically.

There is no standard solution on what should be done to eliminate or protect against the interference caused by ac electrified railroads. Many factors, such as conductivity of the soil, single track or double track railroad, distance between catenary and parallel wire circuits, length of circuits, mutual inductance, current and frequency in the traction circuit, as well as the catenary design, play an important role in creating, reducing or eliminating the interference phenomenon.

A report to the railroad electrification committee of the Edison Electric Institute in June 1970, made these statements about inductive interference, radio interference and cathodic protection:

"The load current in the trolley is returned to the supply via the running rails and constitutes a source of inductive interference in paralleling communication circuits. This is further aggravated by the harmonics, as well as the fact that part of the rail current will return through the earth. In a report to Committee 13, Electrical Section, AAR, 1958, an analysis of inductive coordination of a 60 Hz railroad was made and it was concluded that the inductive coordination problems introduced by the 25 kv, 60 Hz systems are no more serious than those experienced by electrification projects in the past. This finding was confirmed by a Bell Telephone Laboratories study conducted in 1967.

"Radio interference may be anticipated from two sources: (1) the arcing of the pantograph on the contact wire, and (2) from corona, particularly with a catenary operating at 50 kv. The corona problem may be aggravated by the numerous small cross-section hangers, and sharp-edged fittings associated with catenary hardware. This is an area where detailed testing and investigation appear desirable at any voltage. A properly designed catenary system should limit arcing to a sufficiently low intermittent level that complaints will not occur. This is confirmed by European and U.S. experience on existing systems.

"The ground return currents associated with single-phase railroad loads will affect the existing ground potential along the railroad right-of-way. This current will necessitate examination of the cathodic protection systems associated with existing underground metallic

Inductive interference has been substantially reduced

structures."

Obviously, signal and communications facilities will have to be modified to provide proper coordination, and many of the changes will have to be made without unduly interfering with the heavy traffic. An intensive look at this phase of electrification was presented at the spring meeting of the ASME/IEEE railroad meeting by C. E. Staples, chief engineer-planning, Signal & Communications Division, WABCO. The changes that will be required for signaling and communications facilities include:

"(1) Eliminating all wire circuits or placing them in buried, ferrous-wrapped, grounded-metallic sheathed cable, limiting cable length between repeaters with twisted pairs, or coaxial conductors, as far from the track as feasible.

"(2) Converting track circuits to compatible types.

"(3) Properly grounding instrument housings and equipment.

"(4) Drawing power from high voltage lines or from the propulsion system.

"(5) Providing protective devices," Staples said. (See also RAILWAY SYSTEM CONTROLS, June 1971, pages 18-19.)

Numerous solutions to reduce or eliminate the unnecessary side effects by the catenary systems have been applied and proven to be successful.

Booster transformers are used to provide a passage and induce the return currents to travel from the rail through a return wire, and thereby establish an opposing field to the catenary system of almost equal strength. This approach has been found very effective, especially in populated areas. It has been found that application of booster transformers and return wires have reduced the induced voltages by as much as 95%.

British Railways has electrified a section of the eastern region with 25 kv, 50 Hz traction power. Where telephone circuits exist in the vicinity of the electrified lines, measures giving "suppression at source" of any indirect interferences were applied to the catenary system. Booster transformers of 1:1 ratio were provided, the primary winding being in series with the contact wire, with the secondary winding connected in series with the common rail, or with a special return conductor carried on the traction overhead structures.

The effect of the booster transformer is to step up the return voltage at intervals so that the return current will pass through the metallic returns rather than by dissipation to earth. This produces a more balanced magnetic field system. Where booster transformers were provided, the immunization of signaling circuits was simplified, thus becoming less costly than elsewhere, British Railways reported. But the relative costs of the immunization of signaling circuits where no booster transformers existed, to the cost of booster transformers were of the order of 1:10, so that in later sections of the line booster transformers were only installed where interference with telephone circuits was intense and in such instances return conductors were provided.

British Railways found that the rail and return conductor booster transformer arrangements affect the 50 Hz potentials which are experienced by track circuits and associated equipment. Designs permit a maximum of 110 volts between rails of the same track.

Isolating transformers have been used by some railroads where only a few wires need to be protected. Longitudinal induced emf, according to international standards, should not exceed 60% of the test voltage of the cable (between cores and sheath) and of its associated components (loading coils, balancing capacitors, cable terminations, etc.) applied between them and the cable sheath or earth. In order to reduce the longitudinal induced emf on a section of the French National Railways, the maximum length of a telephone section was limited to 9.3 miles, adjacent sections being separated by 1:1 ratio isolating transformers. With these arrangements, SNCF found no reason to anticipate a voltage dangerous to the cable cores.

Return wires successful

Return wires were all that were needed on some railroad lines to supplement the conductivity of the soil. The conductivity of the soil has a great influence on the induction in the communication wires. Under proper soil conditions, the affected range of induction has been found comparatively narrow. To further narrow the effected range, some railways in Japan, installed booster transformers at 2.5 mile intervals. The interference was conspicuously reduced and the electro-magnetic induction was reduced to 5% or less.

Shielded cables have been used by almost every electrified railroad to protect their own communication circuits that have to be placed within the immediate vicinity of their electrified lines. These railroads have found that when replacing open line wires with cables, it not only reduced the maintenance cost of this communication link, but also provided for expansion of communications circuit capacity.

Catenary feeds, judiciously adapted to local conditions can, on occasions, be very successful in eliminating the interference phenomenon created by electrified railroads. This is based on the fact that the induction effect on adjacent conductors or currents flowing in opposite direction is more or less compensated. Not only with single-phase feed from both ends of the section but also with single-phase feed in two directions, the induced voltages are greatly reduced. The above-mentioned catenary feed technique and its results are from experience on the German Federal Railways and a study by the Association of German Electricians. The study was concerned with a single-phase, 110 kv, 16⅔ Hz electrification section of the railway. Reported to the International Railway Congress Association, R. Buckel, of AGE, went on to say that "it is sufficient to assume that the maximum induction in lines running along the whole length of the railway section is confined, with feed at both ends, to the section between one or the other of the substations and the coupling switch and, with two-way feed from one point, to the section between the substation or feed point and the end of one or the other of the feed sections.

"As the choice of suitable substation sites is already often limited owing to building developments, it is advisable to make the most of the possibility of feeding in opposite directions, e.g. by providing a switching post at a point where the catenary system can be fed radially so that parallel telecommunication lines are not, throughout their whole length, affected by currents flowing in the same direction. This advantage of single phase feed is lost if different sections are fed from different phases.

"If these measures on the power side are not sufficient, or not practicable, it is necessary to resort to protective measures on the telecommunications side. Here, it is sometimes more economic to lay entirely new cables with better reduction effect, rather than modifying the transmission system. By using cable sheathing of high longitudinal conductivity, e.g., aluminum sheaths, it is possible, even with small induced voltages, to obtain a very good reduction."

The aforementioned are only some of the solutions used by electrified railways to reduce or eliminate the interference phenomenon created by ac electrification. It does show that the interference phenomenon can be controlled.

RSC RAILWAY SYSTEM CONTROLS

THE DECADE AHEAD:

A $3.5 Billion Market in

- Communications
- Data Processing
- Signaling

Railroads and mass transit authorities in the United States and Canada will be spending over $3.5 billion for system controls equipment and services in the coming decade. Annual spending which totals $352,800,000 breaks down this way: Communications capital spending comes to $50 million with non-capital spending amounting to $75.5 million. Data processing capital spending amounts to $8.3 million per year, while non-capital expenditures total $88.5 million annually. Capital spending for signaling is $52.5 million annually with non-capital spending pegged at $78 million. The above-mentioned figures are for equipment only and do not include expenditures for supervision, labor or other costs not directly accountable to equipment.

Communications non-capital spending largely represents leased communications circuits and equipment from telephone and telegraph companies. For many railroads this covers circuits to off-line traffic offices and the communications equipment at those offices.

Data processing non-capital spending is largely represented by lease of computer equipment.

Non-capital spending of signaling is largely for items for maintenance and replacement, accounted for as an operating expense. Also, non-capital items in communications and data processing for maintenance and replacement are similarly accounted.

COMMUNICATIONS. Railroads will be spending more for communications equipment and services to keep pace wih demands. Communications usage in the rail and transit industries has been growing at a rate somewhat comparable to that of other industries. For example, data transmission volumes are increasing at rates of 40% to 50% annually. Voice traffic (telephone) is rising 25% to 30% annually. Message or administrative traffic is showing a growth rate of 10% annually.

Money for communications will be spent in two major areas: (1) For equipment and facilities to expand the railroads' privately-owned communications plant, and (2) for services and facilities leased from communications common carriers or equipment manufacturers. Obviously, many roads will spend money in both areas. But a shift toward more expenditures for private communications is discernible and will probably increase rapidly due to favorable rulings of the Federal Communications Commission. For example, interconnection of customer-owned facilities with the public telephone network is now permitted. Thus, railroads can have both lease and buy policies. Some railroads use a combination of their own equipment with that of communications common carriers (telephone and telegraph companies.)

For railroads, relaxed interconnection regulations mean that they are not required to lease the connecting or interface equipment from the telephone or telegraph companies. This could be an incentive for railroads to purchase their own dial telephone exchange equipment, data sets and computer input/output units, all of which can be interconnected to the public telephone system. Many railroads will find it advantageous to purchase such units for off-line traffic offices, which heretofore had to be equipped with telephone or telegraph company equipment.

A recent FCC decision could provide an additional source of revenue for those railroads having their own private microwave systems. FCC has ruled that new specialized common carriers which meet technical and financial standards (which most observers agree that railroads would meet the standards) are free to compete with the established telephone and telegraph companies. Railroads with microwave systems could—with the addition of some equipment—provide specialized services, such as data transmision.

To provide these new services, a railroad would probably add microwave radio, channelizing equipment and antennas at existing microwave stations. Existing buildings, power supplies, station sites, towers and access roads could be used. The microwave for the new services would operate on different frequencies than those used for the railroad's own communications.

TELEPROCESSING. The impact upon communications by the computer has been tremendous, and computer requirements for communications links will continue to grow at a rapid pace. The on-line, real-time computer systems of railroads are really teleprocessing systems, which are a form of information handling in which a data processing system utilizes communication facilities.

Major trends in data processing and management information systems and services in the years ahead include refining of computer programs to make them more efficient; expanded interchange of data between railroads, often on a direct computer-to-computer ba-

Copyright © 1971 Simmons-Boardman Publishing Corporation.

sis; greater use of simulation techniques for solving everyday problems; and exchange of programs among railroads.

In the data processing area, there will be expenditures more frequently for mini-computers (price range $3,000 to $25,000) for special purposes, such as providing outputs from several automatic car identification scanners. Also expenditures will be focused on upgrading present large computer systems to newer, faster and greater capacity third and fourth generation units.

SIGNALING. Major areas of expenditures will be for centralized traffic control, often from one or a few locations; remote control of interlockings; and controls for automatic classification yards. Installation of process control computers at classification yards will continue at the rate of up to five yards per year. Control equipment costs for an automatic yard run in the $2 to $10 million range depending upon the various technological and operating requirements.

Highway grade crossing protection equipment expenditures should run in the range of $10 to $15 million per year. It could go considerably higher if some of the present thinking prevails in the legislative areas. For example, the greatest impetus could come from federal legislation requiring states to spend at least 10% of their federal aid highway funds on highway-railroad grade crossing protection equipment. At present, states may spend this 10% for crossing protection, but are not required to do so. Present and near term trends indicate that about 1300-1500 rail-highway grade crossings per year will be equipped with automatic flashing-light signals with or without gates.

The Federal Railroad Safety Act of 1970 instructs the Secretary of Transportation to undertake a comprehensive study and report within one year on the problem of eliminating and protecting railroad crossings, including a study of measures to protect pedestrians in densely populated areas along railroad rights-of-way, together with his recommendations for appropriate action.

One of the key elements in any grade crossing protection program is money. Who's got the money? Local, state and federal governments, that's who! Fortunately, some states back in the 1930's —Illinois being one of the pioneers— recognized that the motoring public should help pay for crossing protection equipment. Ratios used by many local and state governments are 5% city, 5% county, 10% railroad and 80% state funds for installation of crossing protection devices. In many cases, where the crossing is of a state highway only, the state will pay 90% of the installation costs. California pays a portion of the cost of maintaining crossing protection equipment on state highways.

RAPID TRANSIT. Major development and installation trends show increased use of (1) control centers for power, communications and signaling on transit systems; (2) widespread use of radio on all vehicles—rail and highway—and by police and supervisory personnel as well as for maintenance-of-way forces; (3) system-wide station coverage with public address systems and greater use of television at stations, particularly where automatic fare collection is in service; and (4) application of automatic car identification to provide for automatic route control at junctions, and to provide basic data for maintenance scheduling of cars; and (5) greater use of computers for total system control.

What follows is market information concerning specific equipment, systems or components that railroads and transit authorities in the U.S. and Canada will be buying in the coming decade. The categories are considered to be of major importance, although not every type of equipment or system is represented. Where monetary figures are given, they are representative of hardware costs only, and in the case of total systems will be less than the usually stated budget figures. Budget figures or approval for expenditure (AFE) statements include costs of installation (such as labor, supervision, taxes, etc.).

AUTOMATIC CAR IDENTIFICATION. For all practical purposes, the interchange freight car fleet is equipped with automatic car identification labels. Estimates are that by the end of 1971 approximately 150 aci scanners will be installed on U.S. and Canadian railroads and transit authorities. Estimates are that approximately 1,000 major yards in the U.S. and Canada could be equipped with aci scanners where such scanners could improve efficiency, reduce clerical errors and provide a return on their investment. Total market potential for aci scanners, which probably will be installed during the coming decade, appear to be as follows: 3,-150 aci scanners at major yards; 2,500 aci scanners at unattended interchange points; and 500 aci scanners for miscellaneous other uses such as in conjunction with weigh-in-motion scales, at interlockings to automatically align routes

SIGNALS & COMMUNICATIONS represent the

for trains, and at intermodal terminals (piggyback) for identifying inbound and outbound trailers and containers when hauled by rubber-tired tractors. In this latter instance, some estimates are that aci scanners at roadside might total as many as 2,000 alone.

BATTERIES. The annual purchases by U.S. and Canadian railroads and transit authorities of storage batteries is estimated to be 486,800 cells ranging in capacities from 16 ampere-hours per cell to 280 ampere-hours or greater per cell. The types of cells considered in this report include lead-acid, nickel-iron alkaline and nickel-cadmium types. Estimated value of the annual purchases of storage batteries by railroads and transit authorities is over $12 million.

Batteries are extensively used for signal equipment and facilities. Annual purchases of cells for new projects or new facilities and annual purchases for replacement in existing facilities are as follows: automatic block signaling- 600 cells new, 25,000 cells replacement; centralized traffice control- 23,000 new cells, 45,000 replacement cells; interlockings- 53,000 new cells, 175,000 replacement cells; electric locks- 10,000 new cells, 7,000 replacement cells; safety detectors (hotbox, clearance, etc.)-

bulk of the system controls $3.5 billion market in the coming decade.

1,800 cells new, 4,000 cells replacement; classification yards 3,700 new cells, 25,000 replacement cells; automatic train control- 100 replacement cells; automatic cab signals- 300 replacement cells; and highway grade crossing protection- 15,000 new cells, 40,000 replacement cells.

For communications facilities, annual purchases of new cells for new projects and replacement cells for existing facilities, are as follows: microwave stations- 1,000 new cells for new stations, 700 new cells for replacement in existing stations; communications plant (telephone and telegraph or data transmission)- 15,000 cells for new plants, 37,000 cells for replacement in existing facilities; VHF radio stations- 3,000 new cells, 1,600 cells for replacement.

HAND TOOLS. Estimates are that the annual market for hand tools such as pliers, screw drivers, wrenches and soldering irons for use in signal or communications work totals about $250,000. Approximately half of these tools are purchased by individual signal or communications men. The other half of these tools are purchased by railroads for their men.

Signalmen work alone and carry their own tools with them. The same may be true of communications linemen. Where hand tools are used in a repair shop (signal, radio or electronic repair shop), the tools are supplied by the railroad.

Railroads and transit authorities employ about 17,000 men working in signal and communications maintenance.

HOUSINGS. Annual sales of concrete, metal or fiberglass housings and relay cases to railroads and transit authorities will average about 5,000 during the coming decade. Housings are used at hotbox detector sites, at interlockings, in centralized traffic control territory and in retarder classification yards for containing signal control equipment. In the communications area, housings are often used to contain microwave station equipment, VHF radio stations and automatic car identification decoding equipment at the scanner locations.

The annual market for housings is about 2,500. These housings are usually about 6 to 8 feet wide by 6 to 18 feet long and 8 feet high. An annual market of 2,500 relay or instrument cases appears reasonable for the next decade. Relay cases are usually 2 to 3 feet deep, up to 8 or 10 feet wide and 6 feet high. They are mainly used by railroads and transit authorities for containing signal relays, controls and batteries at retarder yards, highway grade crossing controls where gates and flashing-light signals are in service (also where flashers alone are installed), at interlockings, and in block signal and ctc territories.

Approximately 7,500 ground rods wll be installed to provide lightning protection for these 5,000 housings and instrument cases.

POLE LINE HARDWARE. Railroads and transit authorities in the U.S. and Canada maintain and upgrade an extensive pole line system for handling line wire communications and signal control circuits. The following represent an annual market for selected items of pole line hardware. The figures take into account new construction and replacement items. Insulators- 1.5 million; communications ties to attach wire to insulators- 1.5 million; splices for open line wires and guy wires attached to line poles-1 million; dead-ends for guy wires- 150,000; transposition brackets- 100,000; and ground rods installed at instrument cases and housings for signal and communications equipment- 7,500.

RECORDERS, GRAPHIC. Approximately 500 graphic recorders are purchased yearly by railroads and transit authorities for use in signal, communications, mechanical, engineering and research departments. The annual market for re-

Management information systems during the coming decade will require considerable communications support because the need for timely information will be greater for decision making.

cording chart paper or tape for these and graphic recorders now in service is estimated to be 75,000 to 100,000 rolls, based on 200-foot rolls.

Signal departments install graphic recorders at automatic interlockings (where two railroads cross at grade, for example), at heavily travelled (both highway and railroad) railroad-highway grade crossings, at hotbox detector locations, and at automatic classification yards. Additionally, signal and communications departments use these recorders for testing and checking upon the operation of various communications and signal control systems.

Other departments, such as mechanical, engineering and research and test departments often use graphic recorders to make records of events, record operational sequences of sophisticated equipments, and to record testing of events on locomotives and other machines.

While many recorders now in use are of the ink recording type, railroads and transit authorities are using recorders that are equipped with the electro-static printing method and/or the thermal pen recording technique.

RECTIFIERS. Total annual market for rectifiers and/or battery chargers is 17,600 by transit authorities and the railroads in the U.S. and Canada. Communications usage accounts for 550 annually, as follows: microwave stations- 170; telephone exchanges- 150; and carrier repeaters and terminals- 230. For signal installations, annual rectifier or battery charger purchases are as follows: highway crossing protection- 8,400; automatic block signaling- 250; centralized traffic control- 6,000; interlockings- 2,250; and classification yards 150.

To be more specific, following are the annual purchases of rectifiers by type of signal usage or type of rectifier: Track circuit rectifiers- 7,800; rectifiers for battery charging and operation of flashing-light signals and automatic half gates- 2,400; rectifiers for signal line control circuitry- 2,900; rectifiers for signal operating and lighting circuits- 2,900; rectifiers for power switch operation- 850; rectifiers or battery chargers for interlocking or ctc control machine operation- 125; battery chargers for ctc code line operation- 50; and battery chargers for car retarder operation- 25.

RELAYS, MINIATURE. The annual market for miniature relays totals about 500,000 to 750,000 units purchased by railroads and transit authorities. Some of these relays are used in new equipment and systems while others are for replacement purposes. A conservative estimate is that the annual market for miniature relays and associated equipment in this market is between $1 million and $2 million.

Miniature relays- telephone and telegraph type- octal socket- general purpose- sensitive, time delays, latching, etc., are generally used in communications work, although some are used in non-vital circuitry in signal systems. The telephone and telegraph relays are used in the systems so named. Other types of miniature relays are used in microwave systems to handle alarm equipment functions; for various types of remote control of VHF radio stations; in intercommunications systems used in offices, freighthouses and yards. Where various types of switching functions might be handled (usually slow speed), such as remote control of yard track indicators, control of hotbox detector indicator displays, etc., miniatures relays may be used.

SAFETY DETECTORS. Major types of safety detectors in use on railroads and by transit authorities include broken or loose wheel, dragging equipment, high and wide load (clearance), hotbox, presence (wheel), slide fence and snow detectors. Also there are bridge movement, earthquake, high water and fire detectors used in railway and transit service. About 250 detectors all of types are installed annually. Also, about 15,000 feet of slide fence are placed in service annually to alert train crews of falling rocks, earth and mud. Hotbox detectors are being installed at an annual rate of 125 or more.

SOLDERLESS TERMINALS. About 45 million solderless terminals are used each year by railroads and transit authorities for connecting wires to terminal boards and signal and communications equipment. This represents a market of approximately $4.5 million per year. This usage is exclusively in the signal and communications departments. Another 55 million solderless terminals, representing an expenditure of $5.5 million, are used for connecting wires and cables to equipment, such as diesel-electric locomotives, by the mechanical department.

STANDBY POWER PLANTS. Annual purchases of standby power plants are conservatively estimated to be 200, as follows: Centralized traffic control- 25; interlockings- 25; retarder classification yards- 5; wayside VHF radio stations- 50; microwave stations- 50; and miscellaneous signal and communications installations such as loudspeaker systems, data processing centers, portable power plants for signal or communications maintenance gangs- 45.

The microwave systems on railroads and their attendant appurtenances such as power supplies, standby and normal, are specified by the communications department. In many instances, the specification is prepared by the superintendent of communications, and where not prepared by him, it is done by a communications engineer under his direction.

Generally speaking, a microwave proposal is prepared by the communications department and submitted to management. Usually it is in general terms, stating the number of circuits that will be provided, the total cost, the cost per circuit, the type of reliability, and savings that will accrue. When approved by management, the communications department will usually call for bids from various manufacturers and the bids are based upon specifications written by the communications department. If the microwave stations will be in locations where commercial power is available, they will probably specify that standby power generators be provided.

Because microwave is usually used to provide high capacity, multiple channel communications it is most essential that the microwave operate continuously. Dual transmitters and dual receivers are usually installed so that if one fails the alternate is automatically cut into service. Where commercial power is

EXHIBIT IN PRINT

CONVENTION PROGRAM

AAR COMMUNICATION AND SIGNAL SECTION

The Americana
Bal Harbour, Fla.
October 5-7

AAR DATA SYSTEMS DIVISION

Fairmont-Roosevelt
New Orleans, La.
September 20-21

A service by the Simmons-Boardman Railway Age Group

TUESDAY, OCT. 5

10:00 a.m.—**General session**

Keynote address: W. T. Rice, Chairman and Chief Executive Officer, Seaboard Coast Line.

Remarks: John W. Porter, Chairman and President, Railway Signal & Communications Suppliers Association, and Executive Vice-President, General Railway Signal Co.

Remarks: R. D. Liggett, Chairman, Communication & Signal Section, and Chief Engineer, Communications and Signals, Seaboard Coast Line.

1:30 p.m.—**12 GHz—A Microwave Band of Growing Usefulness for the Industrials**—R. F. White, Senior Staff Engineer, GTE Lenkurt, Inc.

2:00 p.m.—**Modernization of Track Side Communications**—Glen T. Fisher, Director of Research, CP Rail.

2:30 p.m.—**Applications of SS1A Selective Signaling Systems to Railroad Communications**—C. J. Stephens, Sales Manager, Wescom, Inc.

3:15 p.m.—Concurrent Workshops

Committee B—**Radio and Microwave Systems,** and **Railroad-Commercial Communication Liaison Committee.**

Commitee C—**Communications and Data Systems,** and **Ad Hoc Committee to Study and Develop ACI Hardware Standards.**

WEDNESDAY, OCT. 6

9:00 a.m.—**The Fully Automatic Hotbox Detector Evaluator**—Paul W. Caulier, Senior Project Engineer, General Electric Co.

9:40 a.m.—**The Distributed Computer Concept**—Charles R. Powdermaker, Manager, Systems Engineering, General Railway Signal Co.

10:20 a.m.—Panel Discussion—**Inductive Interference**—A. J. Hendry, (Moderator) Assistant Director Signal Engineering—Special Projects, Burlington Northern; Members—J. J. Foster, Chief Signal, Electrical and Communications Officer, Reading; R. A. Dent, Assistant Electrical Engineer, Gibbs & Hill, Inc.; A. Hvizd, Chief Engineer, The Kerite Company.

1:30 p.m.—**Fail-Safe Designs Using Solid State Components**—Robert E. Harmon, President, Harmon Electronics, Inc.

2:00 p.m.—**Dead Section Track Circuit Protection**—G. B. Crofts, Manager of Engineering, Railroad Accessories Corp.

2:30 p.m.—**Remarks:** M. R. Sproles, Executive Director, Highway-Rail Programs, Association of American Railroads.

3:15 p.m. Concurrent Workshops

Committee D—**Highway Grade Crossing Protection**

Committee E—**Interlocking, Traffic Control and Block Signal Systems,** and **Special Committee on DOT, FRA Signal Rules, Standards & Instructions.**

Committee G—**Education and Training.**

THURSDAY, OCT. 7

9:00 a.m. **Reports:** Committees A through G

10:00 a.m. **Calgary Yard**—D. H. Walkington, Assistant Engineer of Signals-System, CP Rail; A. F. O'Rourke, Regional Manager, Uniswitch Div., WABCO, Ltd.

10:45 a.m.—**Standby Arrangement for CTC Control Utilizing DDD Facilities**—R. A. Howell, Senior Communications Engineer, Southern.

Who has the power for the subway of tomorrow?

Exide has the power.

This train has no driver. And no track.

It's part of the subway of tomorrow that exists today at the futuristic Houston Intercontinental Airport.

Four battery-powered robot trains carry up to 23,000 passengers every day. They give fast, efficient transportation between terminals, hotels and parking lots. And two minutes is the maximum waiting time. Anytime.

Houston Airport wants the ultimate in passenger convenience, reliability and safety. And that's why their new subway is 100% Exide powered.

Exide has the power for you, too. The same unparalleled performance makes Exide the first name in power systems everywhere...in outer space, under the sea or right here on earth.

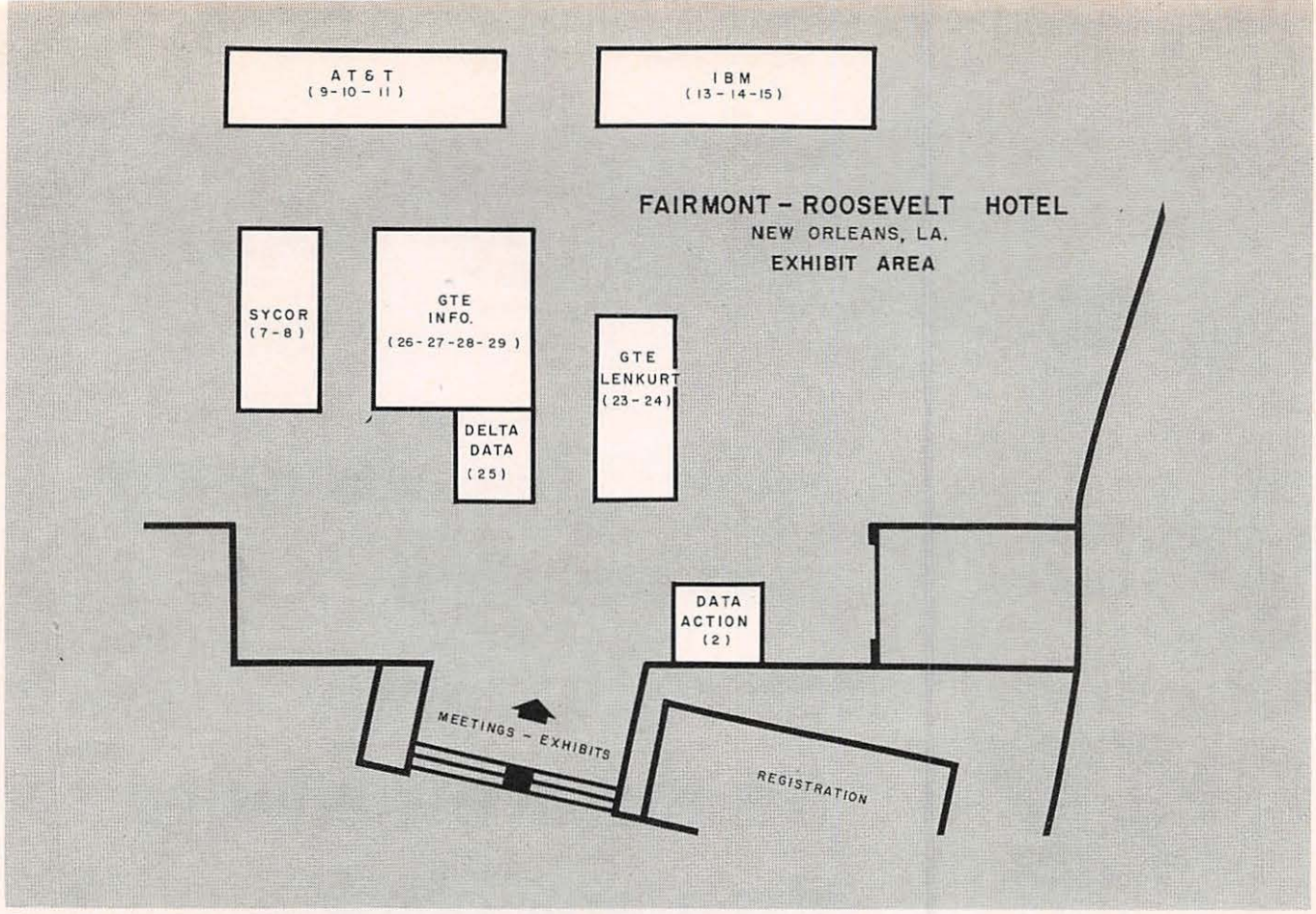
The new line of "Now Power" batteries gives you packaged power whenever and wherever you need it. We'll prove it if you write or call: Exide Power Systems Division, ESB Incorporated, Box 5723, Philadelphia, Pennsylvania 19120.

World Leader in packaged power.

ESB Exide®

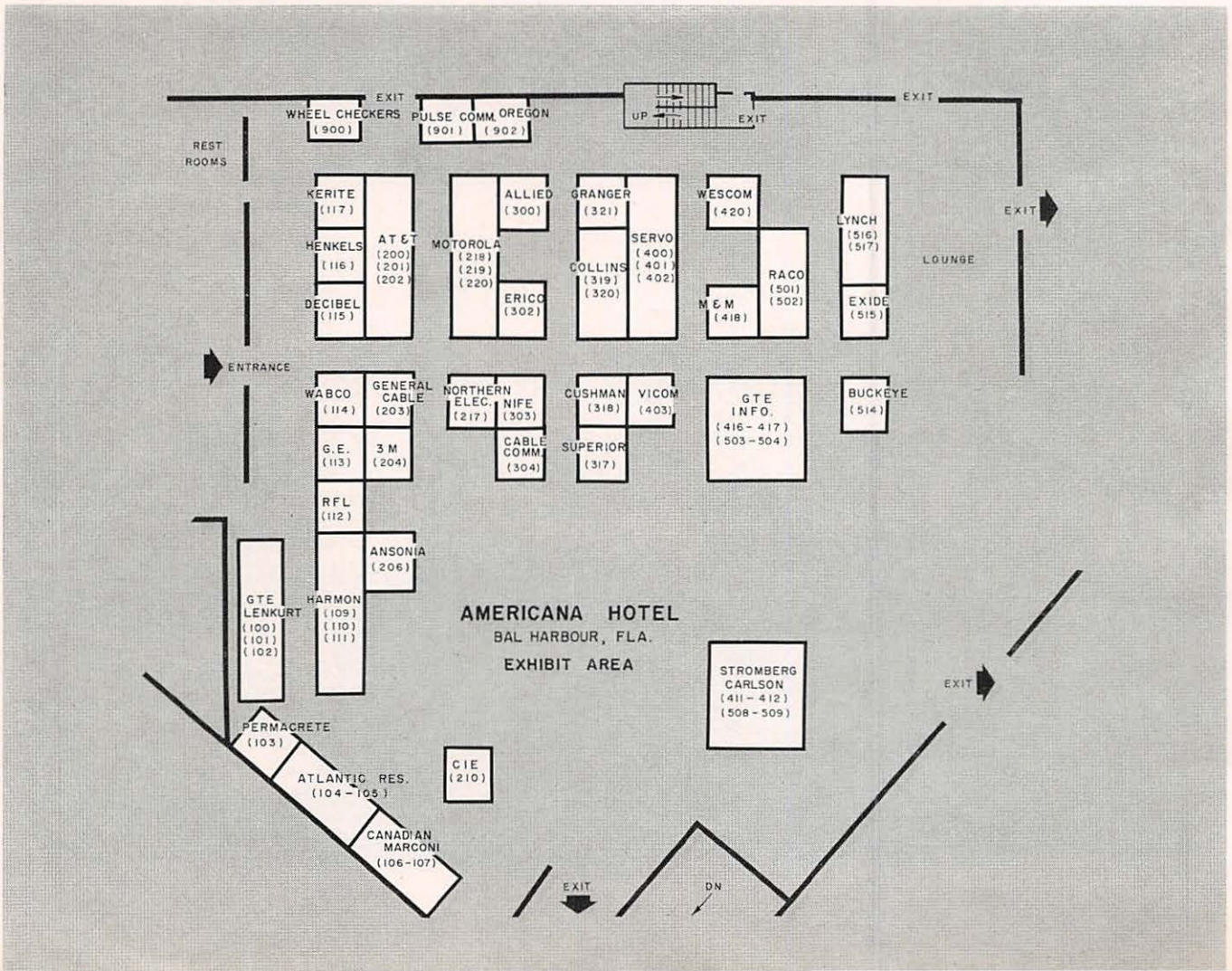
Circle 55 on reader service card

Circle 1 on reader service card



EXHIBITS AT DATA SYSTEMS meeting will feature data communications and I/O terminals.

COMMUNICATIONS & SIGNAL EXHIBITS feature latest electronic technology with integrated circuit usage.



Data Systems Division, AAR

Annual Meeting

Fairmont-Roosevelt Hotel, New Orleans, La.

CONVENTION PROGRAM

MONDAY, SEPT. 20

9:00 a.m.—**General session**

Opening Remarks: L. H. Scott, Chairman Data Systems Division and Assistant Vice President—Systems & Information Services, Seaboard Coast Line.

Keynote Address: Alan S. Boyd, President, Illinois Central.

11.00 a.m.—**Making Uses of Data Bases**—Cdr. Grace Hopper, Director of Navy Programming Languages Division, Department of the Navy.

12:00 N—**Luncheon and Address:** Stephen Ailes, President, Association of American Railroads.

1:30 p.m.—Concurrent Workshops

No. 1: Materials Data Systems
H. M. Hoffmeister, Vice President, Purchases & Materials, Missouri Pacific.

No. 2 : Engineering Applications
R. A. Stane, Manager-Research, Atchison, Topeka & Santa Fe.
G. L. Nichols, Manager-Industrial Engineering, Louisville & Nashville.
R. H. Knittel, Manager-Engineering Systems, Atchison, Topeka & Santa Fe.

No. 3: Marketing Applications
W. Bamert, Assistant Vice President-Administration Planning, Chesapeake & Ohio/Baltimore & Ohio.
W. H. Cramer, Assistant Vice President Traffic Planning, St. Louis-San Francisco.
R. L. Jacobsen, Director, Transportation Research, Denver & Rio Grande Western.
N. Spaeth, Supervisor-Data Services, Missouri Pacific.

No. 4: Automatic Car Identification
J. N. Albertson, General Superintendent Communications-System, Southern Pacific.

No. 5: Mechanical Data Systems
R. F. Tuve, Manager, Quality Control Engineering, Southern.

3:30 p.m.—Concurrent Workshops

No. 6: Use of Computers for Expense Controls
F. H. Coyne, Vice President-Finance, Burlington Northern.

No. 7: Improved Equipment Utilization Using Existing Data Bases
N. K. Ferguson, Assistant Chief Transportation Officer, Louisville & Nashville.

No. 8: Computer Security
J. K. Phillippi, Administrative Coordinator, Bessemer & Lake Erie.
R. F. Curran, Director, Programming Systems Development, Union Pacific.
J. J. Lacey, Manager, Data Processing, Elgin, Joliet & Eastern.
L. S. Imbery, Director, Data Processing, Illinois Central.
G. C. Krahn, Director-Accounting Systems, Burlington Northern.

No. 9: Network Simulation Model
J. N. Cetinich, Manager, Analytic Services, Southern Pacific.
W. R. Benson, Assistant Director, Economic & Management Science Division, Midwest Research Institute.
W. K. Minger, Data Systems Projects, Association of American Railroads.
R. W. Drucker, Assistant Director, Research-Analytical Techniques, Chesapeake & Ohio/Baltimore & Ohio.
R. L. Sauder, Director, Operations Research, Southern.

No. 10: Centralized Reporting and Processing

TUESDAY, SEPT. 21

9:00 a.m.—General session

Terminal ACI Management System—L. I. Dillenbeck, Director of Management Information Systems, Peoria & Pekin Union.

10:45 a.m.—**Panel Discussion—Data Exchange, Problems and Opportunities**
Presentations:
"Central Clearinghouse Data Exchange"—J. L. Jones, Vice President-Management Information Services, Southern.
"Road-to-Road Exchange"—J. W. Germany, General Manager-System Management Services, Southern Pacific.
"Common Codes in Data Exchange"—R. A. Petrash, Executive Director, Data Systems Division, Association of American Railroads.

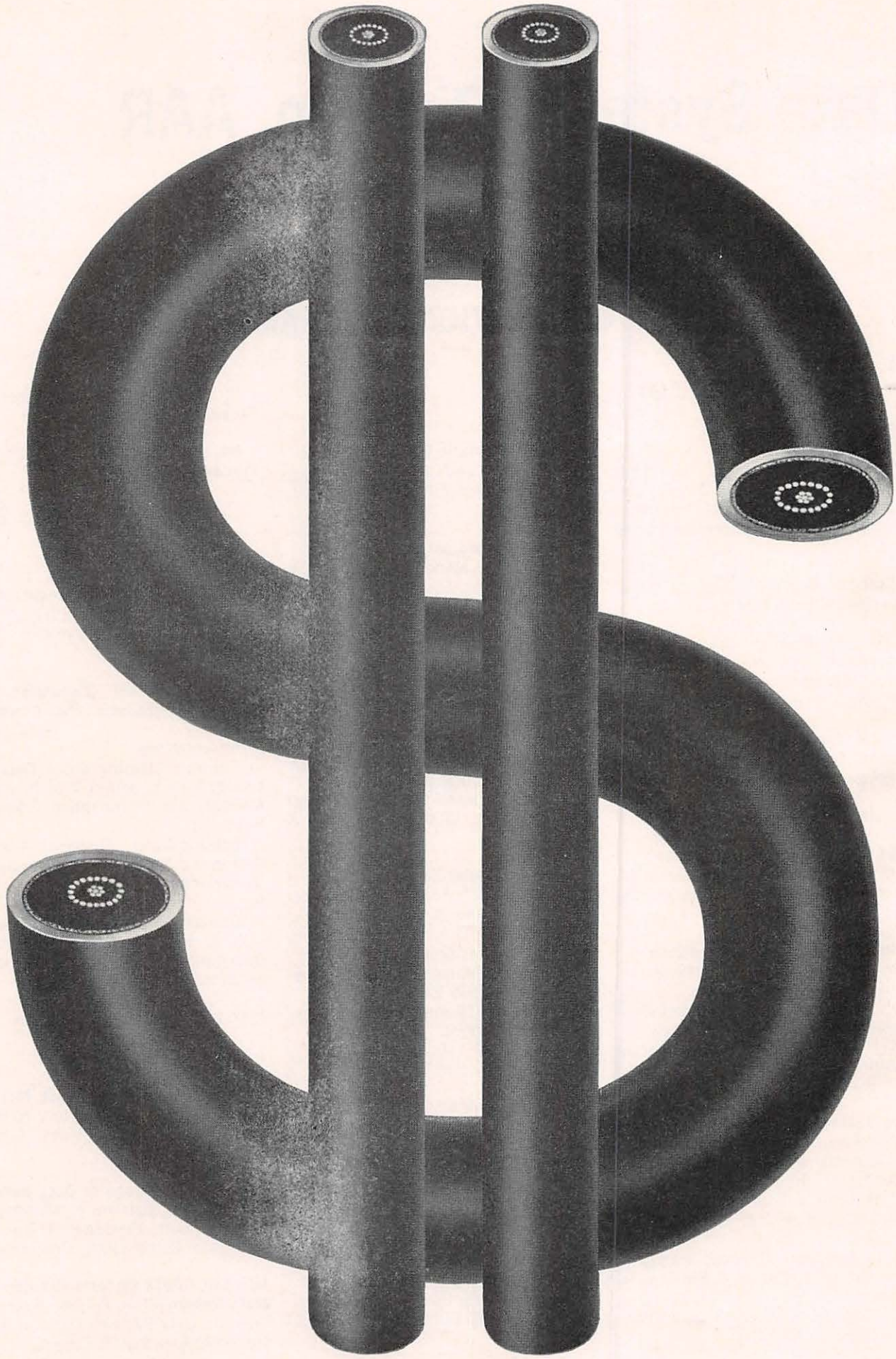
12:00 N—**Luncheon and Address**

1:30 p.m.—General Session

Modern Computer Output Methods—A. E. Pew III, Assistant to Vice President, Management Services, Burlington Northern.

3:30 p.m.—**Exchange of Data Between Shippers and Carriers of All Modes**—E. A. Guilbert, President. Transportation Data Coordinating Committee.

4:15 p.m.—**Data Systems Division Progress Report**—R. A. Petrash, Executive Director, Data Systems Division, Association of American Railroads.



Today, it is more profitable than ever to invest in quality.

Reliability in cable is not a luxury, it's a necessity; replacement cost is prohibitive.

Specify Kerite! You get the Quality Assurance of 116 years of superior performance.

The Kerite Company • Principal Offices: Boston; Chicago; New York; Philadelphia; San Francisco; and Seymour, Connecticut • Sales Representation throughout the United States. A subsidiary of Harvey Hubbell Incorporated.

MEMBER RPI Kerite

the cable that lasts . . . and lasts . . . and lasts . . .

EXHIBIT IN PRINT

COMMUNICATIONS & SIGNALS

Below are listed products and service exhibited at the Communication & Signal Section, AAR, annual meeting. To obtain further information circle EP numbers on the white reader service card at the end of this section.

Allied Communications Equipment Supply (Booth 300)—Completely reconditioned and tested telephone carrier equipment is available. **EP-1.**

American Telephone & Telegraph Co. (Booths 200-202)—Nationwide digital network provides flexibility in handling data transmission. **EP-2.**

Teletype 37 data terminals and their components are described in a 28-page catalog. The terminals operate at 15 characters per second and have complete ASCII capabilities, as well as printing the 94 standard graphics. With an optional shiftout feature, up to 32 characters can be added.

The illustrated booklet describes how the receive-only (RO), keyboard send-receive (KSR) and automatic send-receive (ASR) sets are used for switched network services. Also detailed are such components as the control panel, keyboard, page printer, control logic module, cabinets, and the punch and reader module. *Teletype Corp.* **EP-3.**

Touch-Tone card dialer can handle credit cards with special punched marks or employee identification cards. **EP-4.**

Portable conference telephone has two outside microphones with microphone and speaker in instrument. **EP-5.**

Ansonia Wire & Cable Co. (Booth 206)—Single and multi-conductor (2-37) signal cable is available. **EP-6.**

Control cable has 1-33 conductors. **EP-7.**

Paired aerial and duct or paired buried communication cable has 19 AWG up to 400 pair, 22 and 24 AWG up to 600 pair. **EP-8.**

Quadded aerial or quadded buried is 16 AWG from 7-27 quads, and 19 AWG from 7-32 quads. **EP-9.**

Figure 8 distribution cable is 19, 22 and 24 AWG. **EP-10.**

Atlantic Research Corp. (Booths 104-105)—DQC-61 data quality controller monitors data networks. **EP-11.**

Selector equipment is for teletypewriter operation and control. **EP-12.**

Buckeye Telephone & Supply Co. (Booth 514)—Topo T-15 fiberglass insulators are of double-petticoat design and have low surface conductivity. **EP-13.**

Sangamo data sets transmit and receive at rates of 20 bits/sec to 2400 bits/sec. **EP-14.**

Cable Communication Systems, Inc. (Booth 304)—CCS type SMA-7/24 multiplex provides 24 channels operating in the 12 to 108 kHz range. **EP-15.**

Canadian Marconi Co. (Booths 106-107)—MCS 6900 pulse code modulation microwave radio relay system can handle data and voice transmission, as well as cpu-to-cpu transmission. **EP-16.**

Cleveland Institute of Electronics (Booth 210)—Electronics Technology course has 76 auto-programmed lessons. **EP-17.**

Electronic Communications is a 49 lesson course leading to the FCC 2nd class radio-telephone license. **EP-18.**

Collins Radio Co. (Booths 319-320)—Microwave systems operate in the 6 GHz and 2 GHz frequency bands. **EP-19.**

Series T-216 data modems are for private line applications. **EP-20.**

C System computers are for teleprocessing operations. **EP-21.**

Cushman Electronics, Inc. (Booth 318)—Model CE-3 FM monitor provides guidelines for testing and adjusting of VHF radio transmitters. **EP-22.**

The TTS transmission test system is a complete end-to-end Send/Receive and monitor system with high-level alarm. **EP-23.**

Decibel Products Inc. (Booth 115)

A new booklet contains information about both band-pass and band-reject duplexers and the application of filters in two-way radio communication systems. A discussion of receiver desensitization, transmitter noise, isolation requirements between transmitter and receiver as well as how these requirements can be accomplished is included. Also included are graphs showing the attenuation provided by vertical separation of antennas and by horizontal separation of antennas. **EP-24.**

Erico Products, Inc. (Booth 302)—Type ED5050 pulse coded overlay track circuit has 21 channels in frequency ranges from 313 Hz to 2706 Hz. **EP-25.**

ESB, Inc. Exide Power Systems Division (Booth 515)—"Now Power" batteries and battery chargers provide standby and primary power where needed. **EP-26.**

GTE Information Systems Inc. (Booths 416-417, 503-504)—KarTrak automatic car identification systems read color coded labels on rolling stock. **EP-27.**

Model 1500 Tempo 1 computer can be programmed with Assembly or Fortran languages. **EP-28.**

The Novar 5-41 is an on line conversational terminal, which can be interfaced with all third generation computers compatible with Selectric typewriters. Parity error generation and transmission is a standard feature. When a parity error is detected, it does not lock the keyboard. A two character buffer provides a temporary storage of data. thus preventing a loss of synchronization and/or keyboard lock-ups.

A built-in modem is available. Unattended operation of the terminal is available when used with automatic answer Data-phone or DAA. *Novar Corp.* **EP-29.**

Ultronic modems, multipliers and cathode ray tube terminals provide a line of data display capability. **EP-30.**

GTE Lenkurt, Inc. (Booths 100-102)—The 25D telegraph transmission system provides 75 to 200 bits/sec teletypewriter capacity. **EP-31.**

The 26D data set has 4800 bits/sec capacity plus a 150-baud secondary channel. **EP-32.**

The new 74-channel 36A multiplex system uses a polylithic crystal filter, which allows the system to set new standards of size, cost, performance and reliability for light-route multiplex equipment.

The 36A uses a low-level transmitted-carrier, single-sideband modulation technique and produces a line frequency spectrum between 4 kHz and 300 kHz. Standard 4-kHz channels may be inserted anywhere within

this frequency range to suit any application requirement.

Another advantage of the 36A design concept is its direct modulation plan to line frequency which provides the most conservative use of bandwidth, since there is no lost frequency spectrum due to intermediate group modulation of channels as is required by other systems.

The 36A has been designed to meet the needs of those light-route communications systems where quality transmission of both message and data signals is mandatory. Only a single adjustment of the receive signal level is required. Testpoints are provided for monitoring both the transmit and receive drop levels. **EP-33.**

The 46A3 channel bank is high-density multiplex equipment for microwave and coaxial transmission. **EP-34.**

The 46V coaxial cable communications system provides 2700-channel capacity or 1200 channels plus video over two coaxial tubes. **EP-35.**

The 78F2 microwave radio system has 600-channel maximum capacity, 5-watt power output for 2 GHz frequency band. **EP-36.**

The 960B journal data transmission system transmits highly accurate trackside journal temperature data over open wire, cable or microwave facilities. **EP-37.**

General Cable Corp. (Booth 203)—A complete line of signal and control cable comes in various conductor sizes and insulations to meet most any requirement. **EP-38.**

Communications cable, including coax meet most any telecommunications requirements. **EP-39.**

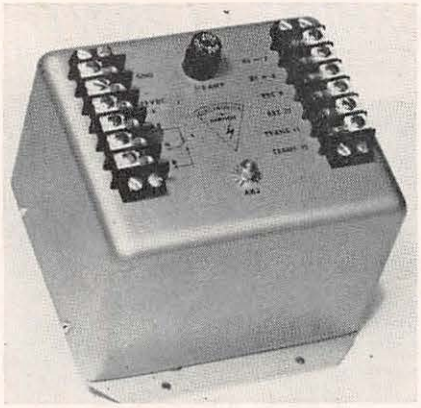
Pole line hardware includes clamps and supports for multiconductor cable including figure 8 wire and cable. **EP-40.**

General Electric Co. (Booth 113)—

A new brochure describes GE's coordinated shutter type hot journal detection systems, and discusses in detail the new five year guarantee on the shutter mechanism of the hotbox detectors. **EP-41.**

Granger Associates (Booth 321)—G/A model 6010 microwave provides five full channels plus optional order wire in the 790 to 960 MHz band. **EP-42.**

Harmon Electronics Inc. (Booths 109-111)—Model 310A flashing-light signal features all aluminum castings. **EP-43.**



Model 1515A high frequency train activated circuit is similar to a standard AFTAC equipment, but is designed as a short distance track circuit of only 50 ft. High frequency operation is at 20 KHz, 25 KHz and 30 KHz. Input voltage is 10—14 volt DC and input current is 125 ma. Transmitter has output impedance of 2 ohms, output voltage minimum 0.1 volts, 2 ohms load.

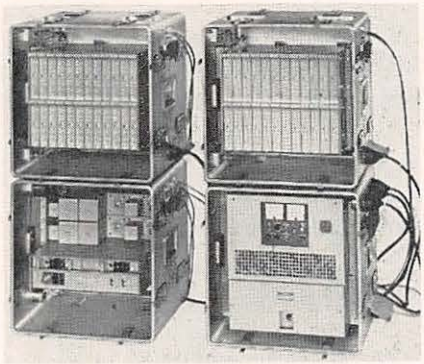
The HFTAC receiver has an input impedance of 1.5 ohms. Sensitivity is greater than .015 volts and selectivity is 30 db down from the next adjacent channel. Frequency stability is ±0.5%. Relay voltage is 12 volt DC nominal 500 ohms. Ring by is a 5 ft maximum adjusted with .06 ohm shunt. **EP-44.**

Henkels & McCoy (Booth 116)—Telephone plant construction and installation features mechanized plowing in of cable along rights-of-way. **EP-45.**

The Kerite Co. (Booth 117)—Single wire and stranded insulated wire for case wiring meet most any requirement. **EP-46.**

Multi-conductor signal cable meeting or exceeding AAR standards is available in a complete line. **EP-47.**

Lynch Communication Systems (Booths 516-517)—



The B910B portable microwave multiplex package is designed to meet requirements for emergency restoration and can establish temporary service on an immediate basis. Each end of the system is self-contained in four portable, lightweight aluminum cases with color-coded interconnections to permit rapid and simplified installation.

The B910B portable package is a transistorized, low density radio multiplexing system using single-sideband, suppressed carrier transmission to provide 24 voice channels in the 8 to 108 kHz spectrum. The system operates on a frequency division basis with each channel occupying a 4kHz slot in the baseband of a microwave radio. One case contains the complete power supply and ringing generator providing —48 volt dc and 20 Hz ac ringing voltage from a 117 volt ac source. **EP-48.**

The B770 tone carrier equipment is for telemetry, telegraph, supervisory control and alarm reporting. **EP-49.**

3M Company (Booth 204)—Heavy duty insulated rail joints feature improved tensile and compression strength. **EP-50.**

M&M Contracting Co. (Booth 418)—Mechanized plowing in of underground cable is a specialty. **EP-51.**

Motorola Communications & Electronics, Inc. (Booths 218-220)—

Incorporating extensive use of thick film monolithic integrated circuitry, the Micor railroad unit offers up to eight RF channels available for multichannel system operations. Micor models are designed for 64/12 volt dc, 64 volt dc, 12 volt dc or 117 volt ac operation. A variable-power transmitter with 45 watts maximum output is incorporated into the Micor railroad units.

Other proven Motorola two-way radio features included in the new Micor railroad radio are the Sensitron receiver with 80 db of intermodulation protection and 100 db selectivity protection against adjacent channel interference. Motorola Private Line squelch, time-out-timer, automatic frequency control, and an 0.0002% transmitter stability are also available. **EP-52.**

Micor mobile radio features plug-in

(Please turn page)

3½ CYCLE OR 3½ HERTZ?

Take your choice! We'll stick with tradition!

As successors to Western Electric in the manufacture and sale of 3½ cycle train dispatching telephone equipment, we continue to supply the railroad industry with new components, spare parts and supply items.

We also offer unit exchange on Type #60 selectors and factory reconditioning of selector keys. We believe that these services help to fill an ever widening gap created by the retirement of personnel skilled in the maintenance of 3½ cycle equipment, as well as by the curtailment of repair activities.

During the past two years, a merger resulted in a new name, PLAT GENERAL. Recent corporate restructuring has restored our former name, GENERAL COMMUNICATIONS PRODUCTS. Our new location is shown below.

GCP GENERAL COMMUNICATIONS PRODUCTS

Division of Alcotronics Corp.
Church Rd. & Roland Ave.
Mt. Laurel, New Jersey 08057
An Alco Standard Company

Circle 2 on reader service card

EXHIBIT IN PRINT

(Continued from preceding page)

module interchangeability with Micor railroad radio to provide over 2600 options. **EP-53.**

Pageboy II is a new shirt pocket size radio pager. **EP-54.**

Low Lite Level CCTV camera works with light levels as low as 0.05 footcandles with automatic light level compensation to work in strong daylight. **EP-55.**

The VP-100 teleprinter provides locomotives, waystations and automobiles with printed messages at 100 wpm over a radio channel. **EP-56.**

Handlie-Talkie portable radios include the new 100 milliwatt HT 100 model. **EP-57.**

Communication control centers coordinates local and system-wide communications including radio, telephone, paging, CCTV, intercom and other functions. **EP-58.**

Microwave systems provide system-wide and local communications channels in all railroad frequencies. **EP-59.**

Nife, Inc. (Booth 303)—

An installation, operation, and maintenance handbook for nickel-cadmium batteries for railroad signal service is now available. The 12-page pocket-size manual covers all procedures—from the time the batteries are received, through installation, operation, and routine maintenance. **EP-60.**

Nickel-cadmium alkaline storage batteries come in many sizes for communications services. **EP-61.**

Wide flexibility is available in a line of battery chargers and packaged automatic battery/charger consoles. **EP-62.**

Static inverters and uninterruptible power systems are available for computer installations. **EP-63.**

Northern Electric Co. Ltd. (Booth 217)—Plowable NE-174 short-to-medium haul composite coaxial cable is for carrier telephone and data systems. **EP-64.**

Type NE-375 long-haul composite coaxial cable is for voice and data transmission. **EP-65.**

Migrabloc is a distribution and toll cable that prevents cable flooding and resulting signal losses. **EP-66.**

Pulp-insulated exchange cable is available up to 3,000 pairs 26 AWG with composite aluminum/soldered steel sheath. **EP-67.**

Oregon Technical Products (Booth 902)—Hotbox detector views arch bar area of freight car truck sideframe. **EP-68.**

Secondary, mechanically operated automatic car identification labels can alert railroad personnel of dangerous operating conditions or equipment failures on rolling stock. **EP-69.**

Permacrete Products Corp. (Booth 103)—A wide variety of concrete housings for microwave, radio and signal equipment installations are available. **EP-70.**

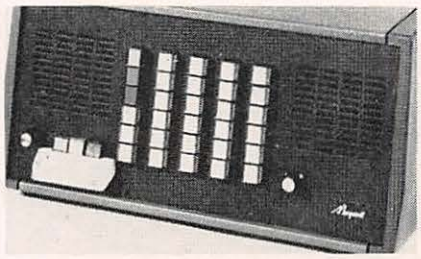
Pulse Communications, Inc. (Booth 901)—Wide variety of teletypewriter control devices are available. **EP-71.**

RFL Industries, Inc. (Booth 112)—All solid-state, modular single-side band voice grade carrier channels are for tone transmission, voice channels and speech plus. **EP-72.**

Variable frequency telemetering equipment, AM and FS voice frequency carrier provide a flexibility in meeting data and voice transmission requirements. **EP-73.**

Data modems are available in operational speeds up to 2400 bits/sec. **EP-74.**

Railroad Accessories Corp. (Booths 501-502)—Unilens colorlight signals can be used for totally new signaling systems or for conversion units for existing colorlight or searchlight signals. **EP-75.**



New pushbutton communications control consoles will accommodate talkback, high-level paging, telephone, radio control and special circuits as required. Consoles are available in sizes from 6 to 120 lines, expandable in increments of 6 lines. Pushbutton banks utilize printed circuit card plug-in techniques. **EP-76.**

Flashing-light signals and/or crossing gate mechanisms are available in a wide variety to meet most any grade crossing requirement. **EP-77.**

Grade Crossing Predictor provides constant warning time at grade crossings regardless of trains' approaching speeds. **EP-78.**

Pulse-code modulated track circuits provide for a variety of signal applications. **EP-79.**

Models RA-30 and RAD-30 snow melters can be remotely or automatically controlled. **EP-80.**

Servo Corp. of America (Booths 400-402)—Model 8808 hotbox detector features rail-mounted scanners and solid-state, all-electronic signal processing. **EP-81.**

Model 8000 trackside hotbox visual display system presents a digital readout pinpointing the hotbox location by means of an axle count. **EP-82.**

Model 1999 Servoanalyzer is for testing of control systems by observing phase and amplitude response with respect to various frequencies and wave shapes. **EP-83.**

Model 404 microwave sweep signal generator is for testing and calibration of microwave systems and components in the frequency range of 1 to 12.4 GHz. **EP-84.**

Series 2,000, 3,000 and 4,000 microwave traveling wave tube amplifiers are rated at 1, 10 and 20 watts for systems and microwave link use. **EP-85.**

Infrared and electro-optics provide for detection of ultraviolet, visible light and infrared radiation. **EP-86.**

Stromberg-Carlson Corp. (Booths 411-412, 508-509). Cross-reed electronic PABX-400A is a basic 100-line electronic telephone exchange that can be expanded to 400 lines. **EP-87.**

Vista-Phones are new model picture telephones (you can see your caller). **EP-88.**

Type SC-835 data modems are available in 75, 110 and 150 baud transmission rates. **EP-89.**

New telephones are available in Orange because this color has been found to have great visibility, hence can be useful as emergency phones. **EP-90.**

Superior Continental Corp. (Booth 317)—Telecommunications wires and multi-conductor cables are available in various sizes for most any requirement. **EP-91.**

Vicom Division, Vidar Corp. (Booth 403)—Wideband data carrier is for high-speed transmission. **EP-92.**

WABCO, Signal & Communications, Division (Booth 114)—Motion monitor MM-10 detects train movement to automatically stop and restart operation of highway crossing signals. **EP-93.**

AFO-II is newly packaged audio frequency overlay track circuit equipment. **EP-94.**

Mark II transmitter installed in the 3R radio provides improved operating characteristics with plug-in modular design. **EP-95.**

The 21CA base station remote control unit is of solid-state design, and up to 10 of these control units can operate with one base radio station. **EP-96.**

The 15AM public address amplifier meets new AAR specifications for rapid transit car applications. **EP-97.**

The new 5-watt Carryphone portable radio provides up to 5 channel operation. **EP-98.**

The 2,2 portable radio is hand-held with plug-in modular construction. **EP-99.**

Wescom, Inc. (Booth 420)—The 470 series, SS1A selective signaling system can meet a variety of application requirements for telephone systems. **EP-100.**

Wheel Checkers (Booth 900)—Broken flange and loose wheel detectors can be effective inspection tools at classification yards. **EP-101.**

Dragging equipment detectors have a self-restoring feature with an option to illuminate wayside lights to alert train crews of detector actuation. **EP-102.**

DATA PROCESSING

Below are listed products and services exhibited at the Data Systems Division, AAR, annual meeting. To obtain more information circle EP numbers on the white reader service card at the end of this section.

American Telephone & Telegraph

(Please turn page)

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL
First Class Permit No. 31775, Chicago, Illinois

Postage Will be Paid by Addressee

RAILWAY SYSTEM CONTROLS
29 EAST MADISON STREET
CHICAGO, ILLINOIS 60602
ATTN: R. W. McKNIGHT

RAILWAY AGE

RAILWAY SYSTEM CONTROLS

Circle numbers for more information. 1 2

EP-1 EP-2 EP-3 EP-4 EP-5 EP-6 EP-7 EP-8 EP-9 EP-10
EP-11 EP-12 EP-13 EP-14 EP-15 EP-16 EP-17 EP-18 EP-19 EP-20 EP-21 EP-22 EP-23 EP-24 EP-25
EP-26 EP-27 EP-28 EP-29 EP-30 EP-31 EP-32 EP-33 EP-34 EP-35 EP-36 EP-37 EP-38 EP-39 EP-40
EP-41 EP-42 EP-43 EP-44 EP-45 EP-46 EP-47 EP-48 EP-49 EP-50 EP-51 EP-52 EP-53 EP-54 EP-55
EP-56 EP-57 EP-58 EP-59 EP-60 EP-61 EP-62 EP-63 EP-64 EP-65 EP-66 EP-67 EP-68 EP-69 EP-70
EP-71 EP-72 EP-73 EP-74 EP-75 EP-76 EP-77 EP-78 EP-79 EP-80 EP-81 EP-82 EP-83 EP-84 EP-85
EP-86 EP-87 EP-88 EP-89 EP-90 EP-91 EP-92 EP-93 EP-94 EP-95 EP-96 EP-97 EP-98 EP-99 EP-100
EP-101 EP-102 EP-103 EP-104 EP-105 EP-106 EP-107 EP-108 EP-109 EP-110 EP-111 EP-112 55

NAME _____
TITLE _____ RAILROAD _____
ADDRESS _____
CITY _____ STATE _____ ZIP CODE _____

EXHIBIT IN PRINT

(Continued from preceding page)

Co. (Booths 9-11)—See listing under Communications & Signals.

Data Action Corp. (Booth 2)—Model 150 magnetic data inscriber is a key-to-tape device for off-line data preparation. **EP-103.**

The 220 Typescribe records source data on magnetic tape at the same time it is typed on an IBM Selectric typewriter. **EP-104.**

The 1500 data editor performs comprehensive editing and validating of input data to make it completely ready for computer processing. **EP-105.**

Delta Data Systems Corp. (Booth 25)—
TelTerm 33 is a teletypewriter-compatible CRT terminal. **EP-106.**

GTE Information Systems, Inc. (Booths 26-29)—See listing under Communications & Signals.

GTE Lenkurt Electric, Inc. (Booths 23-24)—Type 26C data set has a capacity of 150 to 2400 bits/sec transmission. **EP-107.**

For information about the 25D telegraph transmission system, 26D data set, and 960B journal data transmission system see listings under Communications & Signals.

IBM Corporation. (Booths 13-15)—The 3735 programmable buffered terminal is especially suitable for preparation of waybills, advanced consists and switch lists. **EP-108.**

Sycor, Inc. (Booths 7-8)—Input/output terminals have format control. **EP-109.**

Car identification has test labels (EP-110)

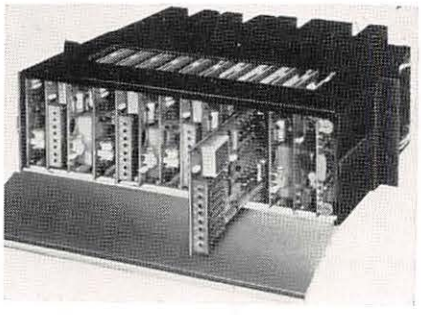
KarTrak test labels are a set of 12 calibrated labels on eight label plates. Each label is designed to test one or more parameters of the scanner and label acceptance logic. To verify acceptable equipment performance each label is scanned, per instructions, and the decoder output is noted.

The label gate is required for proper use of the test labels. The gate chassis plugs into the KarTrak decoder test set connectors. When used with the test labels, the label gate functions to limit the number of scans of the stationary test label. Only two label scans are used on the "input" and "Recognition" series labels, thus simulating a maximum speed train; and 100 scans are used on the "Rejection" series labels to provide an adequate logic test. *GTE Information Systems, Inc.*

Loudspeaker set has 2 watts rms (EP-111)

The 8106 loudspeaker set provides two watts rms to drive a self-contained speaker. A regulated power supply, along with an automatic gain control circuit ensures consistent operation from −21 to −56 volt battery, without strapping.

The 8106 loudspeaker also features a modified "C" message filter to attenuate noise outside the pass band, ground disable to quiet the set during unused periods, and both 10k and 40k ohm bridging inputs. *Wescom, Inc.*



Multiplex is for low density line (EP-112)

The MC-3001 low density, all solid state SSBSC multiplex equipment provides one to 84 non-synchronized voice channels. Each channel contains a crystal controlled channel oscillator, which permits each channel to operate independently of any common carrier generation equipment.

Identical and interchangeable channel modem cards provide maximum flexibility with minimum spares. A unique vf limiter provided as standard equipment on all channel modems protects against intermodulation, false signaling and accidental high level test tone injection.

All active circuits in the MC-3001 equipment are placed on plug-in cards for optimum flexibility and simplified maintenance or repair. *Motorola Communications & Electronics Inc.*

RAILWAY AGE **RAILWAY SYSTEM CONTROLS**

Circle numbers for more information. 1 2 EP-1 EP-2 EP-3 EP-4 EP-5 EP-6 EP-7 EP-8 EP-9 EP-10
EP-11 EP-12 EP-13 EP-14 EP-15 EP-16 EP-17 EP-18 EP-19 EP-20 EP-21 EP-22 EP-23 EP-24 EP-25
EP-26 EP-27 EP-28 EP-29 EP-30 EP-31 EP-32 EP-33 EP-34 EP-35 EP-36 EP-37 EP-38 EP-39 EP-40
EP-41 EP-42 EP-43 EP-44 EP-45 EP-46 EP-47 EP-48 EP-49 EP-50 EP-51 EP-52 EP-53 EP-54 EP-55
EP-56 EP-57 EP-58 EP-59 EP-60 EP-61 EP-62 EP-63 EP-64 EP-65 EP-66 EP-67 EP-68 EP-69 EP-70
EP-71 EP-72 EP-73 EP-74 EP-75 EP-76 EP-77 EP-78 EP-79 EP-80 EP-81 EP-82 EP-83 EP-84 EP-85
EP-86 EP-87 EP-88 EP-89 EP-90 EP-91 EP-92 EP-93 EP-94 EP-95 EP-96 EP-97 EP-98 EP-99 EP-100
EP-101 EP-102 EP-103 EP-104 EP-105 EP-106 EP-107 EP-108 EP-109 EP-110 EP-111 EP-112 55

NAME _____

TITLE _____ RAILROAD _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Postage Will be Paid by Addressee

BUSINESS REPLY MAIL

First Class Permit No. 31775, Chicago, Illinois

RAILWAY SYSTEM CONTROLS
29 EAST MADISON STREET
CHICAGO, ILLINOIS 60602

ATTN: R. W. McKNIGHT

No Postage Stamp Necessary If Mailed in the United States

used, railroads usually install one set of standby power equipment. In some areas, microwave stations may be located in places not accessible to commercial power. Therefore, duplicate sets of gas or diesel-engine generator sets are installed to provide continuous power. Although many use sets of up to 50 kw capacity, a 10 kw plant is not unusual.

Many railroads use 1 kw standby power supplies at wayside VHF radio stations. These wayside stations are remotely controlled by a dispatcher, and because they are unattended during the night hours—and sometimes totally unattended—it is considered essential that in case of commercial power failures that standby power be provided. In such a case, a power-off relay is provided so that the standby power is automatically turned on when the commercial power fails. Many railroads follow this practice at interlockings where the equipment must be in continuous operation.

Another use for power generating equipment is at interlockings and at the dispatcher's office where centralized traffic control machines are located. Normally the interlocking control machines and the ctc machines operate off batteries which are charged by rectifiers operating off commercial power at 117 volts ac. However, as an interlocking and ctc machine must operate continuously and not be subject to power interruptions, many railroads and transit authorities provide standby engine generator sets to provide the ac for the rectifiers. These plants range in size from 1 kw to 5 kw depending on the interlocking or ctc installation.

Standby power plants are also provided at retarder classification yards, as much of the automatic retarder and automatic switching equipment (car routing) contains electronic components that operate on 117 volts ac. Such power plants range from 50 kw to 100 kw or larger.

Often standby power installations at retarder yards supply not only the power for signaling equipment, but also for the communications equipment, such as yard radio, loudspeaker system, pneumatic tubes, telephone facilities, light-

ANNUAL MARKET FOR SELECTED ITEMS IN SYSTEM CONTROLS

The following are selected items showing annual amounts of purchases for equipment or supplies by U.S. and Canadian railroads and transit authorities in the communications, data processing and signaling areas.

COMMUNICATIONS		
Automatic car identification system scanners	150	
Carrier: Voice, speech plus, telegraph terminals and repeaters	3,500	
Computer Input/Output Terminals	750	
Data Sets (Data Modems)	1,000	
Intercom Systems:		
Talk-back and paging speakers	2,000	
Telephones	500	
Microwave stations	150	
Miniature relays (telephone-type)	500,000	
Supervisory control terminals	4,000	
Telephone Systems:		
Automatic exchanges	50	
Telephones	4,000	
Teletypewriters	3,000	
Teleprinter punched paper tape	10,000,000	rolls
Teleprinter hard copy paper	7,500,000	rolls
Test instruments and equipment	$2,000,000	
Traveling wave tubes and klystrons	$1,000,000	
Vacuum tubes (except TWTs & klystrons)	500,000	
VHF mobile radio sets	2,500	
VHF base radio stations	500	
VHF radio antennas	3,000	
Walkie-talkies & portable radios	3,000	
MISCELLANEOUS:		
Graphic recorders	500	
Ground rods	10,000	
Hand tools	$250,000	
Housings and relay (instrument) cases	5,000	
Metal towers (VHF radio & microwave)	500	
Recording chart paper or tape (200 ft rolls)	100,000	
Mini-computers (process control costing $25,000 or less)	25	
POWER SUPPLIES:		
Dry cells (Walkie-talkies)	500,000	
Wet cells (Walkie-talkies)	7,500	
Flashlight and lantern batteries	$2,000,000	
Rectifiers and battery chargers	17,600	
Standby power plants	200	
Storage batteries	486,800	cells
Switch lighting batteries	25,000	
SIGNALING:		
Automatic half-gates for highway crossings	1,000	
Detectors (dragging equipment, rock slide, high-wide load, high water, presence, etc.)	250	
Electric locks for hand-throw switches	250	
Electric switch lamps	200	
Flashing-light signals for highway crossings	2,600	
Graphite switch plate lubricant	218,500	gallons
Hot Box Detectors	150	
Insulated rail joints	200,000	pairs
Power switch machines	500	
Signal rail bonds	4,000,000	
Car retarders	30	
Signals (Colorlight, searchlight, position light type)	2,000	
Switch heaters (snow melters)	500	

System controls will highlight technology.

ing, etc. While it is true that many yards are in areas where commercial power is quite reliable, the thinking among many railroad officers is that a multi-million dollar expenditure for a yard will certainly justify the expense necessary to provide standby power facilities.

As far as computer centers are concered, dual power facilities are considered essential by many railroads. They may be a combination of commercial and standby or even dual standby power facilities. Such installations usually include line voltage and frequency regulation so that a smooth flow of power at correct voltage, frequency and phase is supplied to the computer complex.

WIRE AND CABLE. The annual market for wire and cable used by railroads and transit authorities is usually expressed in two ways: in pounds of copper and conductor mileages. The following is the annual purchases in poundage for the various types of wire and cable: aerial cable (multi-conductor)- 4.4 million lb; underground cable (multi-conductor)- 4.0 million lb; inside cable (in buildings, multi-conductor)- 400,000 lb; track cable (1 conductor)- 200,000 lb; telephone drop wire (1 pair)- 40,000 lb; ac power (line wire)- 1.0 million lb; ac power (drop wire, 1 pair)- 140,000 lb; case wire (insulated, 1 conductor or stranded)- 240,000 lb; messenger for cable (1 conductor or stranded)- 260,000 lb; line wire- 5.0 million lb; guy wire (stranded)- 300,000 lb; coaxial cable (VHF radio or microwave antenna lead)- 20,000 lb.

Purchases annually of wire and cable by conductor mileages (1 wire for 1 mile is 1 conductor-mile) is as follows: Signaling installations consume 50,700 conductor miles of wire: automatic block signaling- 1,540; centralized traffic control- 15,695; highway crossing protection- 6,630; interlockings- 18,430; retarder yards- 2,645; and safety detectors- 5,760. Communications installations consume 29,350 conductor miles annually: carrier equipment- 175; intercommunications systems- 3,835; microwave stations- 1,230; pole lines- 14,725; VHF radio stations- 215; retarder yards- 2,175; and yard loudspeaker systems- 6,995.

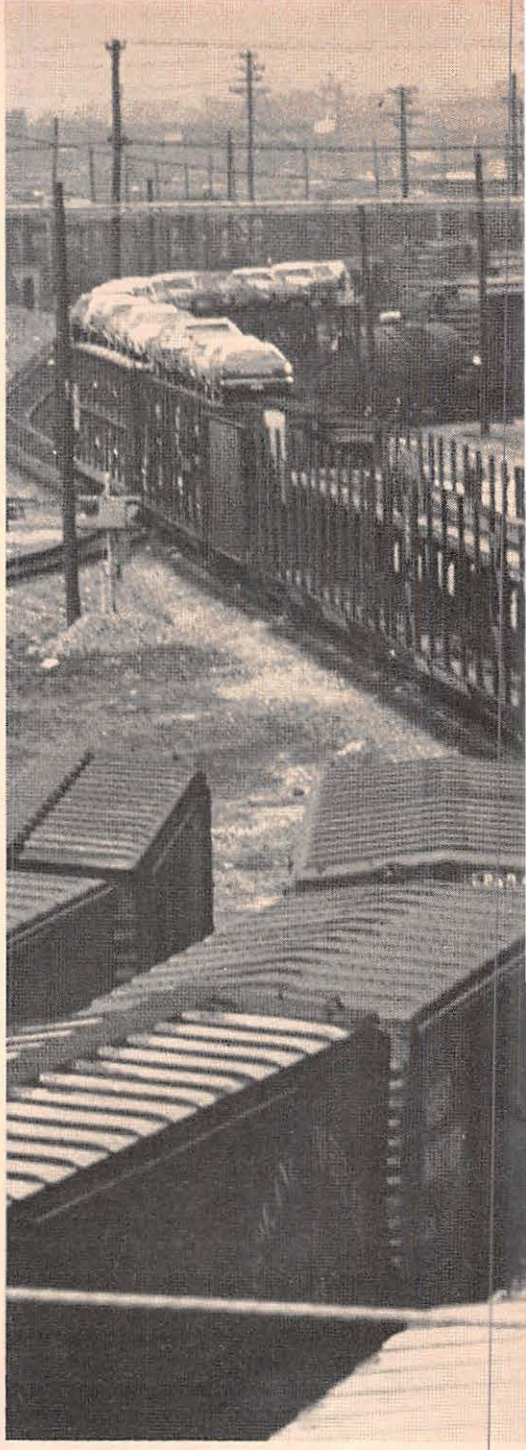
VHF RADIO. Yearly purchase of two-way radios will hold at about 7,500 units during the coming decade. Of this figure, about 3,000 will be portable sets or walkie-talkies. These portable sets are widely used by supervisory personnel in operations, mechanical, signal and communications and maintenance-of-way departments. Also, much use of portable radios is made by train and yard crews, inspecting carmen, radio and electronic maintainers and foreman and machine operators in maintenance-of-way track gangs.

Approximately one-half of the radio sets purchased by railroads and transit authorities are replacements for existing sets that are worn out or beyond economical repair.

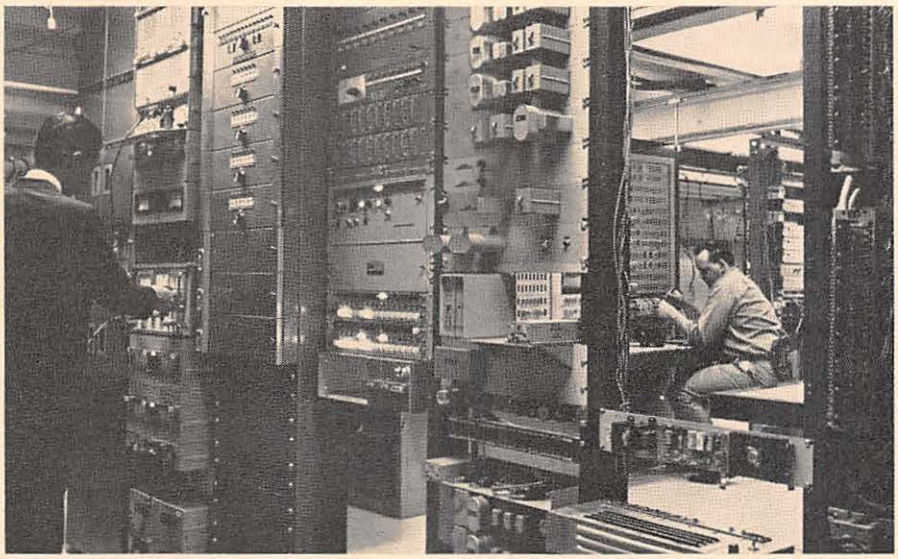
In addition to radio equipment, associated items such as antennas, housings for wayside stations and remote control equipment are also being purchased in considerable quantities. Approximately 500 base stations are installed each year, many of which require instrument cases or housings. Also, most railroads are installing remote control systems for providing dispatcher-control of wayside base stations. The market for such controls will probably average about 200 stations annually and at least 50 master control equipments at dispatchers' offices. The market for antennas should be about 3,000 per year.

TELEMETRY AND CONTROLS. The estimated annual market for telemetry or supervisory control terminals is 4,000 to 5,000. Supervisory controls also include tone control equipment for transmission of data from various types of detectors, such as hotbox, clearance, etc. Supervisory controls may also be used to remotely operate, test and report on devices and conditions at remote locations from the central control headquarters. Some examples include: Alarm and remote testing of microwave stations; electrical power distribution substations on rapid transit systems and electrified railroads to handle fault indications and recovery controls; remote control of VHF radio stations; reporting from automatic car identification scanners, may be at 100 words per minute teletypewriter speed and format, or may be at 2400 bits per second or at other higher speeds directly into a computer memory or disc file; controls and indications between a central dispatching point and several ctc or interlocking field locations.

Many railroads are consolidating dispatcher's positions. While much of this requires increased voice transmission facilities, there is also an increase in the amount of supervisory control transmission equipment if centralized traffic control is involved. If ctc machines are moved to a central headquarters, then control and indication systems must reach out to the old locations and bring



ACI will bracket key yards.



COMMUNICATIONS TEST CENTERS will be vital for continuous service.

CENTRALIZED TRAFFIC CONTROL will be installed on key mainlines.

data into and send controls out from the new headquarters.

Some railroads are installing new pushbutton centralized traffic control (remote control of power switches and signals) machines with greater capacity (300 to 500 miles) to handle several territories formerly handled by many control machines. This can be done because of the development of high-speed data transmission systems. For example, one railroad consolidated over 2,000 miles of ctc territory into four control points (actually 4 control machines).

Most ctc consolidations are really just remote controlled interlockings extending over a distance of several hundred miles. It seems reasonable that at least 25 major railroads are moving toward centralization of ctc and interlocking controls. With automatic car identification, the field is open to have trains automatically set up routes for themselves through interlockings and over ctc territories. This automatic routing will give impetus to truly centralized mainline control. All dispatching would then be handled from one central location or headquarters.

Supervisory controls will play a leading role on rapid transit systems. In power distribution and control, substations and feed points may be spaced ranging from ½ mile to about 5 miles apart. Electrified mainline railroads will have such stations spaced about 7 to 10 miles apart. Telemetering systems will continuously monitor these substations and report on status conditions. Automatically, and also via manual remote control, devices will be used to change the status or conditions at these stations to correct faults, prevent failures, etc. For this type of control, power line carrier or frequency shift keying systems may be employed. For rapid transit and electrified railroads using dc propulsion current, dc mains are common. Here dc-to-dc converters may be employed to step down dc propulsion current to 12 or 24 volts for control system usage.

With the advent of wide-spread electrification (a possibility within the next decade or so), the increased use of telemetering and remote controls is tremendous.

Also, operations controls and graphic displays for management control centers will require large capacity, high-speed data links to meet information requirements.

TELETYPEWRITER EQUIPMENT. Annual purchases of teletypewriters by U.S. and Canadian railroads and transit authorities will total about 2,000. Also, another 500 teletypewriter units will be leased annually. Some of these purchased and leased units will replace older units. Additionally, railroads and transit authorities will purchase about 125 reperforators and lease about 100 reperforators annually. These figures should hold or even increase during the decade ahead.

Estimates are that about 10,000 teletypewriters and about 2,500 reperforators are now on lease from telephone and telegraph companies and from manufacturers. Also, approximately 40,000 teletypewriters and 7,500 reperforators are owned by railroads and transit authorities.

Teletypewriter units in service are generally of three types: Sending only, Receiving only, and combination Send-Receive equipment. Reperforators, as the name implies, produce punchings in paper tape.

Paper tape and hard copy paper annual purchases by railroads and transit authorities will be: 10 million rolls of punched paper tape (8-inch rolls); 7.5 million rolls of hard copy paper (single

or multiple copy forms in rolls).

METAL TOWERS. The annual market for metal towers on railways and transit authorities of the U.S. and Canada is estimated to be about 500. Of this figure, approximately 400 metal towers are used to support VHF radio station antennas. Also, towers are used to support floodlights to illuminate yard areas. Approximately 50 such towers are installed annually. Another 50 metal towers are installed annually at microwave stations to support antennas or passive reflectors.

Also, each tower must have lightning protection. This usually consists of connecting ground rods to the towers at each point of contact with the ground. These ⅝-inch by 8 feet long rods are usually driven at the legs of self-supporting towers, and at the anchor and base points of guyed towers. Approximately 2,500 ground rods are installed to provide lightning protection for these towers.

INPUT/OUTPUT TERMINALS. The annual purchases by railroads and transit authorities of computer input/output terminals is about 4,750. Upwards of 250 computers are in service on U.S. and Canadian railroads and transit authorities. Devices used to communicate with computers—either to input data or receive information from computers—are generally known as input/output terminals or computer I/O devices. Teletypewriters are also considered to be I/O terminals. Annual purchases or lease of teletypewriter units runs to about 3,000. Other types of I/O terminals are being purchased or leased at the rate of about 750 annually by railroads and transit authorities.

I/O terminals range from electric typewriters and teletypewriters to cathode ray tubes or other types of visual display devices. I/O terminals may produce punched paper tape, punched cards, imprint data on or read from magnetic tape and produce hard copy (paper) printouts. Most I/O units can be used off-line, that is, can be used to prepare material for transmission while not connected to the communications circuit. This method enables the data to be prepared by a person who would operate at a much slower rate than that used to transmit the data over the communications circuits. Off-line preparation not only saves transmission time, but permits unattended or automatic transmission. Also, many I/O terminals can operate in an unattended receive mode. This may permit receipt of data at night when commercial communications circuit costs are lower than during daytime business hours.

Teletypewriter units and I/O terminals may communicate with each other rather than directly with computers. Present data transmission usage is growing at the rate of 35-40% annually by volume on railroads and transit authorities.

Data sets—often called data modems (MOdulation-DEModulation)—are used to electrically condition communications circuits for data transmission as well as convert data from I/O terminals to an electrical signal that can be transmitted. Data sets are placed between the I/O terminal and the communications circuit at both ends of the transmission path. At the receive end, they reconvert the electrical signals to a form that can be accepted by the I/O unit. The annual market for data sets or data modems is 1,000.

RAIL SIGNAL BONDS. The annual market for rail signal bonds is estimated to be 4 million. Of this number 750,000 are installed in territories of new signal construction such as automatic block signaling, centralized traffic control, interlockings and highway grade crossing installations. The replacement market for signal bonds is about 2,750,000 annually. About 500,000 signal bonds are installed when new or relay rail is laid in signaled territory.

INSULATED RAIL JOINTS. Railroads and transit authorities in the U.S. and Canada will purchase about 200,000 pairs of insulated rail joints annually, with a market value of approximately $20 million.

There are approximately 400,000 pairs of insulated joints in service. While the life of insulated rail joints varies, a conservative estimate is between 2 and 3 years. Admittedly, only the end post may wear out in this time – on some railroads in welded rail territory, the end post lasts only 6 months. But taking into account total and partial replacement, the estimated market for replacement is upwards of 175,000 pairs of insulated joints annually. Another 20,000 pairs of insulated joints are purchased annually for new installations.

LUBRICANT, GRAPHITE. Railways and transit authorities in the U.S. and Canada are using approximately 218,500 gallons of graphite switch plate lubricant annually. The yearly increase in usage is estimated to be 5,500 gallons.

While there may be about 350,000 switches on these railway and transit properties in the two countries, approximately 39,500 are power operated in yards, centralized traffic control and interlockings. Normal practice is to use graphite lubricant on power switches because of the improved ease in operation, plus the fact that such power switches are unattended. Some railroads use graphite lubricant on hand-throw switches. Assuming 2% being so lubricated, then this would amount to 7,000 hand-throw switches.

Of the total of 39,500 power switches in service, distribution is as follows: switches in ctc territory-13,500; switches in interlockings- 20,700; and switches in retarder yards- 5,300. The number of switches on which graphite lubricant is used are 39,500 power switches and 7,000 hand-throw switches.

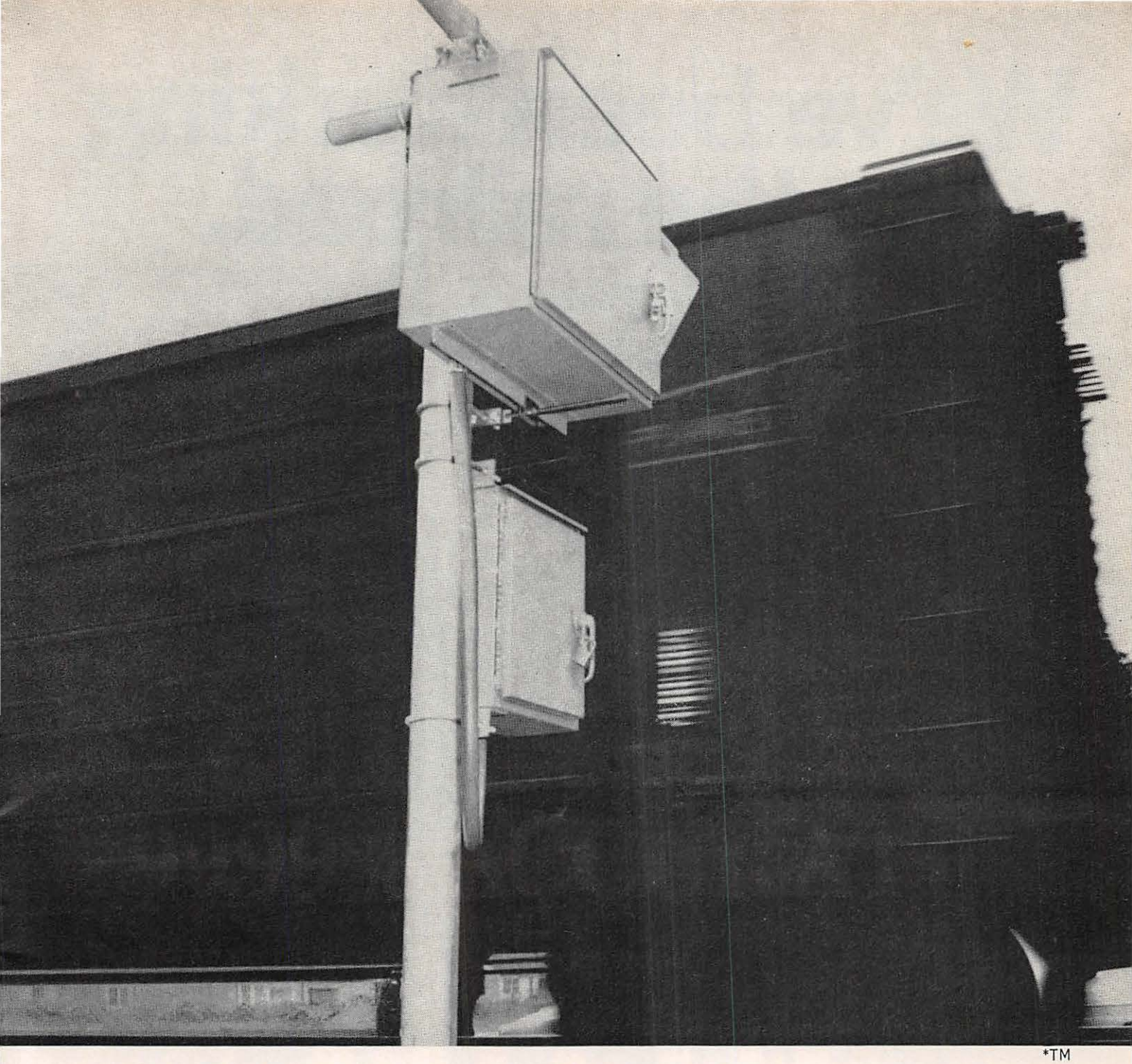
This information is based upon consultation with major railroads using graphite switch plate lubricant, in which they estimate their usage to be at the rate of 5 gallons per power switch per year. For hand-throw switches, their usage is at the rate of 3 gallons per switch per year. Thus the market for graphite switch plate lubricant is 218,500 gallons per year for present switches in service.

About 800 power switches are installed per year as follows: in ctc territory- 400; in interlockings- 250 and in retarder yards- 150. Thus the 800 plus another 500 hand-throw switches added each year that are being lubricated with graphite, comes to a total of 1,300 switches added for this graphite lubricant market. Using the same rates of usage as above, this annual increment for graphite switch plate lubricant usage is 5,500 gallons.

SWITCH HEATERS. Approximately 500 switch heaters or snow melters are installed yearly on power switches by U.S. railroads and transit authorities that are in snow or ice belts in the winter, and also the Canadian railways and transit authorities. Switch heaters (sometimes called snow melters) are installed on power-operated switches, and usually are of three types—electric, propane or infrared. Some heaters burn fuel oil and have a blower arrangement to force hot air over the switch points, thus producing a melting and moving influence on the snow.

There are approximately 19,000 power switches in service in northern climates where snow and ice are prevalent that could be equipped with switch heaters. Of these 19,000 about 7,000 are in centralized traffic control territory, another 9,000 are in interlockings, and 3,000 are in yards.

Annual installations of power switches for the next decade will probably average as follows (listing only those that are likely to be equipped with switch heaters): ctc territory- 200, interlockings- 200, retarder yards- 100.



*TM

99.99% ACCURATE.

Even we weren't sure KarTrak was that good until a major railroad tested it.

Out of 42,197 label readings in a full-scale test of our KarTrak* ACI system, there were only two undetected errors.

(That's two cars out of about 400 miles of freight cars.)

Which means "Output Accuracy" was 99.99%.

Our Scanner/Decoder system hung up some other nice statistical records.

"Detection of Cars" turned out to be 99.93%.

"Completeness of Message" tested out to 99.72%.

The system detected 100% of all trains on the track.

And it proved to be 100% available —no breakdowns during the entire course of the tests which ran 24 hours a day for a 6-week period.

All these results clearly show one thing:

As long as the labels are readable, KarTrak will detect and report virtually 100% of all cars.

Nobody's perfect.

We'll be glad to tell you more about KarTrak and these tests. And fill all your other data communications needs from terminals, to modems, multiplexers, and front end controllers. Write to: Earl Trantham, Transportation and Industrial Division, GTE Information Systems Inc., 205 Burlington Rd., Bedford, Mass. 01730.

GTE INFORMATION SYSTEMS

Circle 18 on reader service card

We've been working on the railroad.

General Cable has been a major supplier to the railroad industry since 1882.

We supply a full line of communications wire and cable. Coaxial cables. Control and signal cables. Power cables. Trolley wire. And we supply a great deal of supporting equipment as well. Like support hardware for Figure 8 Wire and Cable, Cross Over Clamps, Suspension Clamps and other cable support items from Diamond. Cable pressurization equipment from Puregas. Tie splints, transposition brackets, galvanized Line Wire and galvanized Guy Strand from Indiana Steel and Wire.

But quality products aren't all we supply. We provide General Cable know-how and experience to help you choose, design and specify the right product for the job.

So call on General Cable whenever you need information, products or service. And you'll always be on the right track. Write: General Cable Corporation, Section 600-24, 730 Third Avenue, New York, N.Y. 10017.

General Cable

NEW "BIG IDEAS" FROM KAMECO...

Products for the Railway and Telecommunications Industry

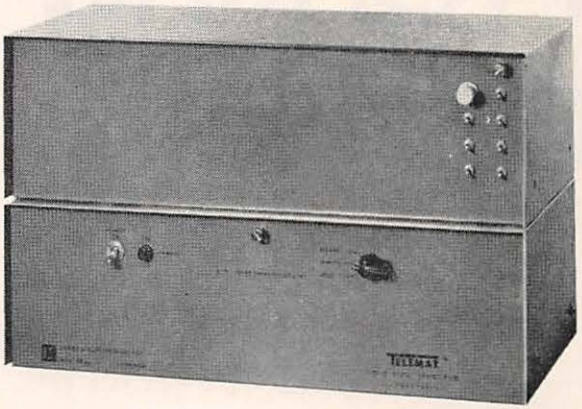
TELEMAT UNIVERSAL COMMUNICATIONS TERMINAL SELECTOR

The Telemat Universal Selectors provide control sensing and switching facilities for all commonly used codes of data transmission. This equipment utilizes almost entirely I/C components of the TTL type. The design concept is of a Universal type and allows for the final programming to be completed by the user without wiring changes. Four operating speeds of up to 2400 Bauds are available as standard strapping options and most programing can be completed by U-link insertion on a program matrix board. The complete modular design offers flexibility and simplifies sparing.

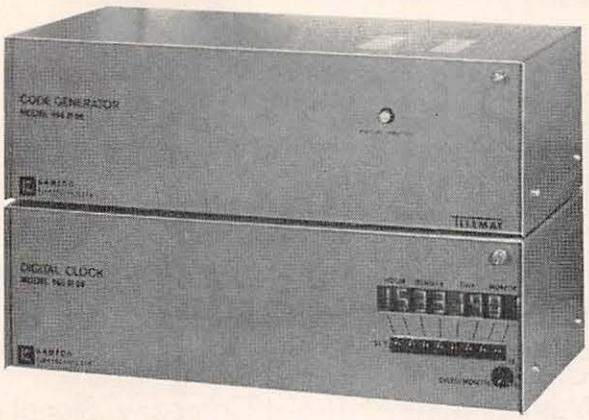
Using this approach, most administrations can satisfy their entire network requirements by employing only one type of Universal Selector, for 5-level Baudot and 8-level ASCII codes. Special Selectros are available and systems can be programmed in the factory to the customers requirement. This equipment is suitable for controlling a great variety of business machines, including Teleprinters, Tape drives, Card punches, Card readers, CRT terminals etc.

TELEMAT CODE TRANSLATORS

Kameco offers a complete family of Telemat Code Translators. These units are self-contained and modularily constructed for ease of installation and maintenance. The logic is comprised almost entirely of I/C components of the TTL type and offers great reliability. Translation can be achieved between any machine language and almost any speeds. Unique in the Kameco line of translation is the availability of memory units for message storing and speed conversion. Interface adaptors are available for most business machines.



TELEMAT DATE AND TIME GENERATOR



A family of Format Generators is available including a Date and Time Generator controlled by a digital clock. These Generators can be locally or remotely controlled and are suitable for generating canned or pre-fixed messages and this equipment is ideal for Header generating followed by subsequent messages.

This equipment provides for automatic generating of the hours, minutes, day, months, station identification, codes, etc. Unique with this equipment is the insertion of a sequential message number. The date and time generator provides for full flexibility in programming for its standard 32 characters with the capability of expanding the capacity in increments of 32 characters. This equipment functions completely automatic and has incorporated controls to operate associated data terminals. The standard Date and time generators provide line signalling for both 5-level Baudot and 8-level ASCII and selective speeds of up to 2400 Baud.

KAMECO ELECTRONICS INC.

1080 PORT ROYAL WEST, MONTREAL, QUEBEC • TELEPHONE (514)331-6100

Other products of Kameco include;

Dial Alarm Reporting and Control System • Polled Alarm Reporting Systems • Solid State Dialling Units • Time Division Multiplexing •

Circle 14 on reader service card

We have over 600 working patents.

Working for you.

When you serve the railroad industry as long as we have, it is only natural that you would have some patents. But 600? That's more than any other company. Fact is, we're the world's largest producer of railway and rapid transit signal and control systems. Our products for improving rail service include:

- Centralized Traffic Control Systems
- Automatic Classification Yards
- Highway Grade Crossing Protection
- Automatic Train Control
- Automatic Train Operation
- Two-way Radio and Inductive Communications

And today, we have even more to offer with Sub-transit Monorail systems.

Want to know more? Contact Westinghouse Air Brake Company, Signal & Communications Division, Swissvale Post Office, Pittsburgh, Pennsylvania 15218.

WABCO

An American-Standard Company

Circle 16 on reader service card

Circle 41 on reader service card

PCM
on microwave

Ten years experience in PCM microwave technology. That's Canadian Marconi Company's record. A record you may not have been aware of — because our major customers don't say too much about their purchases.

But now you, the commercial communications user, can benefit from CMC's experience in PCM-on-radio.

Our MCS 6900 MICROWAVE COMMUNICATIONS SYSTEM* is an integrated multiplex/radio combination designed to serve your voice and data communications needs — digitally.

Plan now to meet the ever-increasing demands which will be placed on your communications systems in the future. Go digital. With the MCS 6900.

Contact us for more information. Let us tell you about the better way to communicate.

*The MCS 6900 12.2-12.7GHz model is FCC-type accepted for use under Part 91, Industrial Radio Service.

CANADIAN MARCONI COMPANY
TELECOMMUNICATIONS DIVISION · 2442 TRENTON AVE., MONTREAL 301, P.Q., CANADA
TEL.: (514) 343-3411, TELEX NO. 05-267563, TWX NO. 610-421-3564, CABLE: ARCON MONTREAL

People

ASSOCIATION OF AMERICAN RAILROADS: **John J. Robinson,** assistant director operating-transportation division, appointed executive director and secretary, succeeding **Charles A. Lauby.**

BELT RAILWAY OF CHICAGO: **A. K. McGowan** appointed signal and electrical supervisor at Chicago.

BURLINGTON NORTHERN: **C. H. Dunn,** assistant to director signal engineering, appointed assistant director/signal engineering. **A. J. Hendry,** assistant director signal engineering, appointed assistant director signal engineering-special projects. **W. G. Pearson** and **L. A. Sebeczek,** staff engineers, appointed project engineers, signal engineering. All are headquartered at St. Paul, Minn.

CANADIAN NATIONAL: **H. I. Towle,** signal supervisor, Northern Ontario area, transferred to Great Lakes Region, headquartered at Toronto yard.

CHESAPEAKE & OHIO/BALTIMORE & OHIO: **James R. Winter,** circuit engineer signals, appointed senior circuit engineer signals. **Gilmer O. Johnson,** junior circuit engineer signals, appointed circuit engineer signals. Both are headquartered at Huntington, W. Va. **Kenneth E. Willyard,** assistant regional supervisor communications, Grand Rapids, Mich. appointed regional supervisor communications. **James R. Barnett,** communications inspector, Huntington, W.Va., appointed assistant regional supervisor communications headquartered at Grand Rapids.

Ronald W. Drucker, manager analytical techniques, appointed assistant director research-analytical techniques, at Baltimore. **Jerry B. Dowdy,** systems signal inspector, Huntington, W. Va., appointed assistant supervisor of signals, Covington, Ky. **Arthur E. Nichols, Jr.,** signal maintainer, appointed junior circuit engineer-signals at Huntington.

ELGIN, JOLIET & EASTERN: **Thomas P. Weigel,** industrial engineer U.S. Steel, Joliet works, appointed senior industrial engineer at Joliet.

GRAND TRUNK WESTERN: **Jack D. Chase,** superintendent of communications, appointed general superintendent, communications and signals, with headquarters in Battle Creek, Mich.

ILLINOIS CENTRAL: **David L. Gunn,** assistant to the president, appointed director of operations research, with headquarters in Chicago.

LAND MOBILE COMMUNICATIONS COUNCIL: **John L. McNabb,** engineer communications and signals, Communication & Signal Section, AAR, elected president.

LOUISVILLE & NASHVILLE: **Charles D. Leddon,** director of industrial engineering, appointed assistant vice president-industrial engineering. **Gerald L. Nichols,** senior industrial engineer, appointed manager industrial engineering. **James O. Higgins** appointed assistant signal supervisor, Evansville, Ind. **Donald R. Myrick** appointed signal repair foreman, Louisville.

NORFOLK & WESTERN: **Charlie B. Sowder,** inspector signals and communications, appointed assistant to regional engineer—signals and communications, at Roanoke, Va.

SOUTHERN: **Eugene G. Alexander,** signal and electrical supervisor, Tuscaloosa, Ala., transferred to Hattiesburg, Miss. **Arthur T. Hanak** appointed signal and electrical supervisor, deButts yard, Chattanooga, Tenn. **James E. Stewart,** assistant signal su-

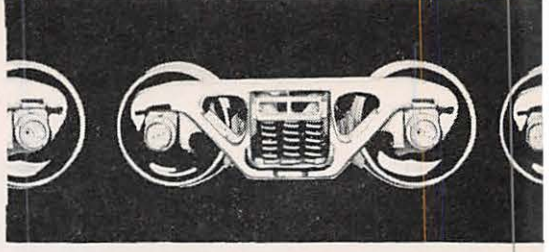
(Please turn to page 48)

Jack D. Chase
Grand Trunk

Thomas M. Taylor
ACI Systems Corp.

Robert E. McIlvane
Anaconda Wire

Peter C. Bradshaw
Edison Battery



Servo is the world's leading producer of electronic hot box detector systems.

We're not experts in every phase of railroad safety—but as the industry's pioneer designer and producer of electronic hot box detection systems, we can claim a high level of successful experience in working on the problems of bearing failures, axle burn-offs and derailments associated with undetected hot boxes.

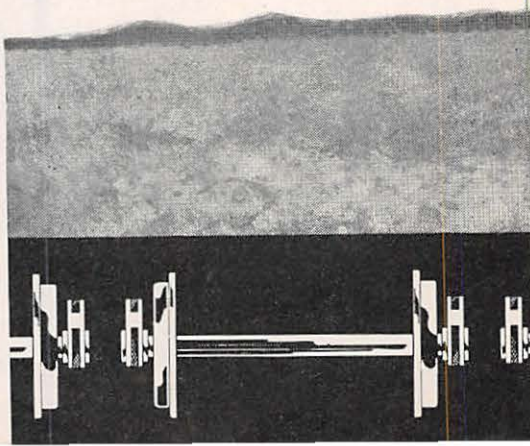
Since 1957, more than 1,600 SERVOSAFE Hot Box Detective Systems have been put into service by 54 of the world's major railroads, and have compiled an unequaled record of safety improvement, more efficient preventive maintenance procedures and cost reduction.

Hot box detectors available from Servo offer the widest flexibility in choice of system configuration, features and functional options, including: rail-mounted or ballast-mounted scanner; a complete selection of ancillary and test equipment; solid-state electronic signal processing. Several modes of data read-out are also available—automatic digital read-out at trackside or remote location; pen-paper recorder chart for visual interpretation; FM carrier data transmission over unlimited distances.

With our broad range of products and world-traveling network of field engineers, we can readily "customize" the design, manufacture, installation and operation of a SERVOSAFE system to best meet the particular requirements of your railway.

You are invited to contact us for complete descriptive literature, or to arrange a field engineering site survey and application review—without obligation, of course.

See SERVOLARM at the AAR Show Miami, Oct. 5-7



Circle 17 on reader service card

Hot box hide-n-seek. A dangerous game.

Hot box hide-n-seek is an old game — as old as railroading itself. And the villain in the game is the overheated journal that you can't find until it's too late — that's when it worsens into a really dangerous axle burn-off and costly derailment!

The safe way to beat the hot box at its own game is with a SERVOLARM® Model 8000 Trackside Hot Box Visual Display System. Designed to operate with any SERVOSAFE® Hot Box Detective™ System, the SERVOLARM visually signals the presence of a hot journal box and also pinpoints its location. SERVOLARM helps to eliminate train stops and crew delays. It simplifies and speeds up the entire hot box location procedure by directly notifying the crew via a trackside bi-directional display board — a digital readout shows the axle count location of the hot box. If there are no hot boxes, the display board reads "000."

SERVOLARM can be quickly and easily installed with a minimum of construction equipment and labor, while eliminating long distance wiring and extensive communication equipment costs.

If you're looking for an easier and safer way to win the game of hot box hide-n-seek most of the time, take a look at SERVOLARM.

Train crew on the Cincinnati-Atlanta line of the Louisville & Nashville Railroad gets the "OK" signal from a SERVOLARM Trackside Hot Box Visual Display.

servo

MEMBER RPI

SERVO CORPORATION OF AMERICA
Hicksville, N.Y. 11802 Tel. 516-938-9700
European Office: Lausanne, Switzerland

1946-1971

25

25 YEARS OF SERVING SAFETY THROUGH SCIENCE

PEOPLE

(Continued from page 46)

pervisor—construction, Macon, Ga., appointed signal and electrical supervisor there. **Robert T. Mitchell,** assistant signal and electrical supervisor, Hattiesburg, Miss., transferred to Birmingham, Ala.

Willie V. Reedy, signal maintainer, appointed assistant signal and electrical supervisor, Slidell, La. **R. Jackson Witcher,** signal draftsman, Atlanta, appointed assistant signal and electrical supervisor, Macon, Ga.

UNION: Ralph W. Hoerner, Jr., appointed senior industrial engineer.

Suppliers

ACI SYSTEMS CORP.: Thomas M. Taylor, former assistant to presidents Iron & Equipment Co. and Gunderson Bros. Engineering Corp., appointed regional marketing manager, with headquarters in Atlanta, Ga.

ANACONDA WIRE & CABLE CO.: Robert E. McIlvane, vice president

Douglass E. Kondra
Edison Battery

J. R. Higginbottom
Kerite Company

R. H. Woodruff
Kerite Company

Richard C. Clark
Wabco S&C Division

communications and electronics division, appointed executive vice president-sales.

EDISON BATTERY DIV., McGRAW-

C. E. Shepherd
Wabco, S&C Division

Carl L. Henricks
Western- Cullen

EDISON CO.: Douglass E. Kondra, sales representative, Dictograph Co., appointed service engineer. **Peter C. Bradshaw** reappointed service engineer following active duty with the U.S. Navy. Both will be headquartered in Bloomfield, N.J.

GENERAL RAILWAY SIGNAL CO.: James W. Rafferty, sales engineer in the Chicago office, appointed district manager of the St. Louis, Mo. office.

THE KERITE CO.: James R. Higginbottom, assistant eastern railroad sales manager, appointed assistant to the vice president, railroad division. **R. H. Woodruff,** sales representative, ap-

COMPUTERS NEED U.C.P.*

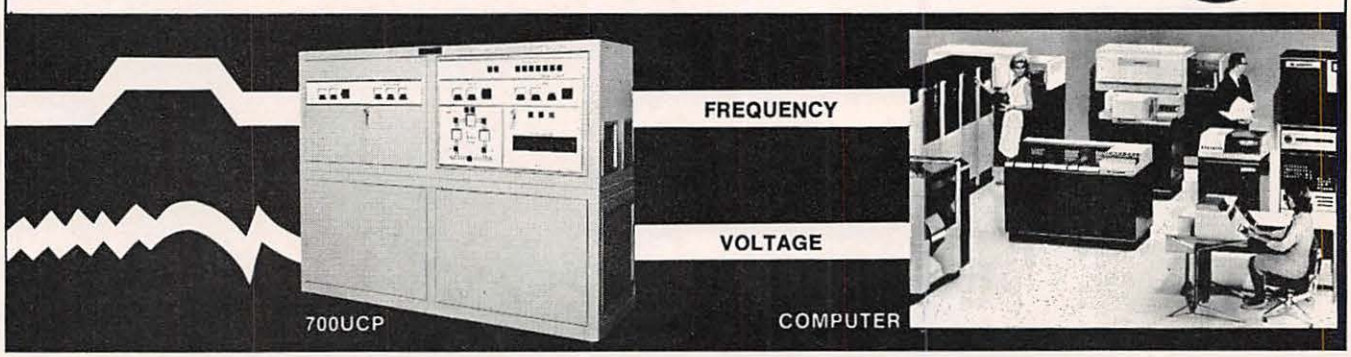
SYSTEM 700UCP PROVIDES
- "BROWN-OUT" PROTECTION
- VOLTAGE CONTROL
- FREQUENCY CONTROL
- TRANSIENT CONTROL
- LINE ISOLATION
- BRIDGES UTILITY POWER INTERRUPTIONS

*UNINTERRUPTIBLE COMPUTER POWER

Call Frank Wood (703) 355-2803 OR WRITE

POWER SYSTEMS & CONTROLS, INC

P. O. BOX 27306 • RICHMOND, VIRGINIA 23261



Circle 32 on reader service card

pointed assistant eastern railroad sales manager, both are headquartered at New York.

RCA GOVERNMENT & COMMERCIAL SYSTEMS: **Harold A. Jones,** formerly vice president and director of operations, Motorola Systems Inc., appointed division vice president, commercial communications systems, RCA Communications Systems Division, with headquarters at Camden, N.J. **Herman R. Henken,** manager advertising and sales promotion, appointed manager commercial marketing services.

SIMPLEX WIRE AND CABLE CO.: **Walton R. Collins Co., Inc.** has been appointed sales agents for all east coast railroad accounts, with headquarters at 121 Coulter Ave., Ardmore, Pa. 19003.

WABCO, SIGNAL & COMMUNICATIONS DIV.: **Richard C. Clark** appointed sales representative with headquarters at Pittsburgh. **Charles E. Shepherd** appointed sales representative with headquarters in Chicago.

WESTERN CULLEN DIV. FEDERAL SIGN & SIGNAL CORP.: **Carl L. Hendricks,** director sales and marketing, appointed assistant to the general manager. **Raymond E. Deasey** appointed director sales and marketing, both are headquartered in Chicago.

ANACONDA WIRE & CABLE CO.: **Norman A. Lorimer,** appointed manager of the communications divisions.

ROCK ISLAND: **W. B. Taylor** appointed signal supervisor at Kansas City. **R. L. Wharry** appointed signal supervisor at Silvis, Ill.

CP RAIL: **J. H. Gilbert** appointed manager, systems and procedures.

Obituaries

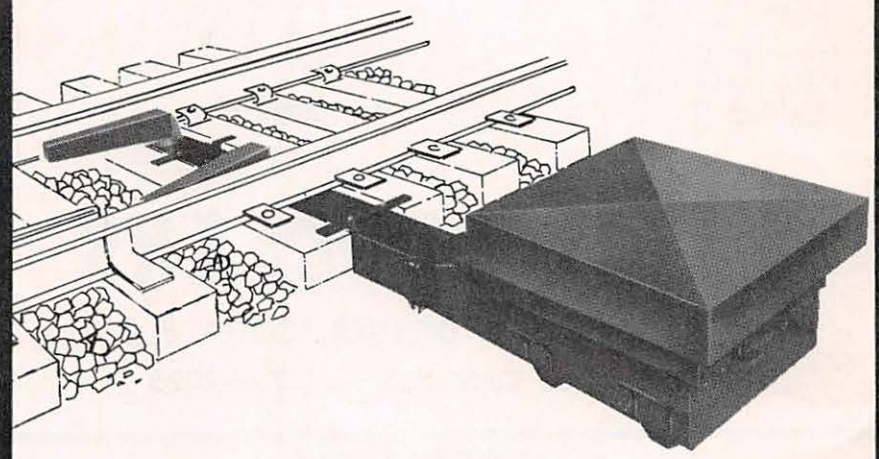
JAMES W. BENHAM, signal and electrical supervisor, Belt Railway of Chicago, died July 20.

R. A. JOHNSON, retired general superintendent signals and communications, former Great Northern, died recently.

CHARLES A. LAUBY, executive director and secretary of the operating-transportation division, AAR, died in July.

RALPH D. PYLE, manager of product engineering, Copperweld Steel Co. died July 9.

NEW!
RAILS COMPANY
HAB
SWITCH HEATERS



proven in use at sub zero temperatures

High pressure blower distributes hot air steadily, evenly, through a duct and nozzles - keeps switch points operating in all weathers.

All components located for easy installation and servicing - separate remote control panel is free from trackside vibration. Hot air duct is electrically insulated against track circuit interference and designed to provide maximum air flow.

Manual or automatic operation. Oil fired, natural gas or propane models available.

Service tested for dependable operation.

Write or call for detailed information.

THE RAILS CO.

Maplewood, N.J. 07040
Omaha, Neb. 68102
Chicago, Ill. 60604
San Francisco, Calif. 94105
In Canada: IEC-Holden, Ltd.

13007

Circle 20 on reader service card

Loose Wheels!
Broken Flanges!
Dragging Equipment!
High And Wide!

DETECTION

SEE YOU AT BOOTH #900

BAL HARBOUR, FLA. MEETING

OCT. 5, 6, 7

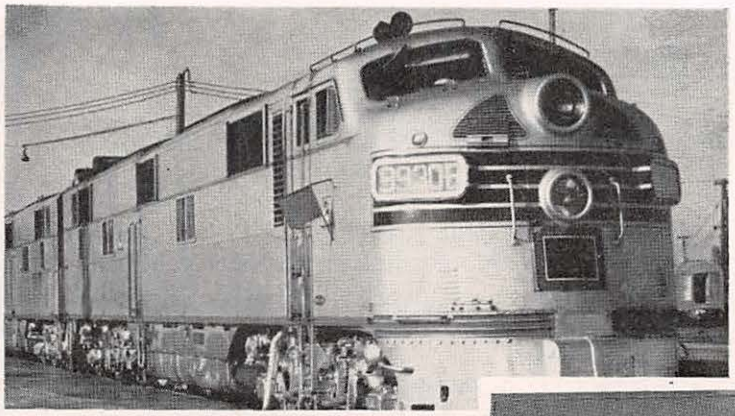
THE AMERICANA

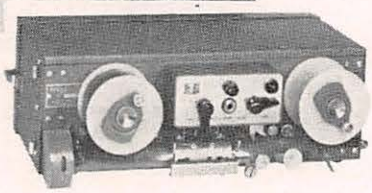
WHEEL CHECKERS

2020 S. BANNOCK, DENVER, COLO. 80223

PHONE: Area Code 303 . . . 722-2026

Circle 21 on reader service card





when verbal communications become critical

Railroads are becoming increasingly aware of the importance of maintaining accurate, permanent records of all verbal communications issued by railway dispatchers and other operating personnel. The availability of such records becomes of critical importance, particularly in cases of accident or freight loss.

The SoundScriber Communications Recording System provides a *proven* method of word-for-word recording which provides permanent, unalterable records which can be invaluable for verification of facts and for legal documentation. SoundScriber Recorders are used by these railroads: the Great Northern, the Northern Pacific and the Soo Line.

SoundScriber Recorders are economical, easy to install and operate — deliver years of reliable service. They provide 24 hours of continuous recording without changing tape reels. Write for complete details today. You may find that it makes good sense to fit SoundScriber Recorders into your communications system.

The SoundScriber Corporation

680 Third Ave., West Haven, Connecticut 06516

Circle 22 on reader service card

News Briefs

Railroads have 250 computers in service

Railroads, rail associations and the AAR now have 250 computers in service. A total of 71 railroads had 246 computers in service as of June 1, 1971. Average monthly rental for these computers total $3,689,700. IBM equipment represents 84% of the total or $3,097,700. Univac average monthly rentals to railroads comes to $137,500 or 3.7% of the total. Other computer manufacturers share of the railway market are as follows: Honeywell, $17,900 or 0.5%; General Electric $128,500 or 3.5%; Collins Radio Co. $60,000 or 1.6%; National Cash Register $8,100 or 0.2%; RCA $240,000 or 6.5%.

Penn Central tops all roads with a total of 28 computers in service, at 11 locations, Canadian National follows closely with 21 computers at 6 locations, and Southern Pacific with 20 computers at 4 locations. Fourth in line is Burlington Northern with 17 computers at 7 locations followed by Chesapeake & Ohio/Baltimore & Ohio with 14 computers at 4 locations. Santa Fe and CP Rail each have 9 computers while Kansas City Southern and Union Pacific have 8 computers each.

FCC gains split from Courts of Appeals

In Washington, the U.S. Court of Appeals for the District of Columbia has upheld Federal Communications Commission orders establishing the present schedule of telpak rates. However, in New York City, another U.S. Court of Appeals said that existing sharing regulations in the telpak tariff of AT&T are unlawfully discriminatory, but the FCC was in error in requiring unlimited Telpak sharing to cure the deficiency. As a result, the New York U.S. Court of Appeals remanded the case to the Commission "for further proceedings to determine what remedy for the existing discriminatory sharing practices would be just, fair, and reasonable, and as to what rates resulting therefrom would be just and reasonable."

According to *Telecommunications Reports:* The court said "We do not

(Please turn to page 52)

You can shop by postcard in

Railway System Controls

HELP YOURSELF . . . to the wide variety of manufacturers' literature shown on the preceding pages. You don't have to write, just circle the numbers on the card below. Then drop the card in the mail (no stamp needed). Railway System Controls will forward your request to each manufacturer and he'll send you complete data free of charge. So . . . get out your pencil and help yourself.

RAILWAY SYSTEM CONTROLS • Reader Service Card

THIS COUPON SERVICEABLE FOR 90 DAYS AFTER DATE OF THIS ISSUE

Circle numbers for more information about products and services.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159	160														

NAME .....

TITLE .....

RAILROAD .....

ADDRESS .....

CITY ..... STATE ..... ZIP # .....

Reader Service Card

Help yourself to information about products, literature and supplies in the signaling, controls and communications areas. Fill out the other side of the card below, tear it out and mail. It's your Railway System Controls shopping guide.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY MAIL

First Class Permit No. 31775, Chicago, Illinois

RAILWAY SYSTEM CONTROLS

29 EAST MADISON STREET

CHICAGO, ILLINOIS 60602

ATTN: R. W. McKNIGHT

ADVERTISING INDEX

ACI Systems Corp. *(Laffey & Porter Advertising)* ...IBC

Alcotronics Corp., General Communications Products .....Exhibit in Print Section

Ansonia Wire & Cable Co. *(Sales Promotion Services, Inc.)* 55

Buckeye Telephone & Supply Co. *(The Warner F. Simpson Co.)* 56

Cable Communications Inc. *(Culver Adevrtising, Inc.)*. 8

Canadian Marconi Co. 45

Cardion Elctronics 11

Collins Radio Co. *(John G. Burnett Advertising Agency)* .....Exhibit in Print Section

Edison Battery Division, McGraw-Edison Co. 6-7

Exide Power Systems Division, ESB, Inc. *(Ketchum, MacLeod & Grove, Inc.)* .....Exhibit in Print Section

General Cable Corp. *(Hicks & Griest, Inc.)* 42

General Railway Signal Co. *(Rumrill-Hoyt, Inc.)* 9

GTE Information Systems, Inc. *(Doyle, Dane, Bernbach Inc.)* 41

Harmon Electronics, Inc. 4

Kameco Electronics, Ltd. 43

The Kerite Company *(O. S. Tyson & Co.)* .....Exhibit in Print Section

Kershaw Manufacturing Co., Inc. *(Douglas Harrison Advertising)* 10

Miller-Stephenson Chemical Co., Inc. *(A. B. W. Toft & Co.)* 57

Nife, Inc. *(Stewart H. Ross Advertising)* 13

Power Systems & Controls, Inc. *(Washington & Lee Advertising)* 48

Railroad Accessories Corp. *(Faber Advertising, Inc.)* .IFC

The Rails Co. *(Black-Russell-Morris)* 49

RFL Industries, Inc. *(Josephson, Cuffari & Co.)* 53

Servo Corp. of America *(Industrial Marketing)* 46-47

Sierra Electronic Operation, Philco-Ford Corp. 12

The SoundScriber Corp. 50

Stainless, Inc. *(Richard L. Renner Industrial Advertising)* 52

Stromberg-Carlson Corp. *(Rumrill-Hoyt, Inc.)* 3

Transandean Associates, Inc. *(Doug'as Brush Advertising Agency)* 54

Vapor Corp., Transportation Systems Division *(Product Presentations)* 51

Western-Cul'en Division, Federal Sign & Signal Corp. *(Merrill, McEnroe, Fox & Associates)* .....BC

Westinghouse Air Brake Co., Signal & Communications Division *(Marstellar, Inc.)* 44

Wheel Checkers 50

Books

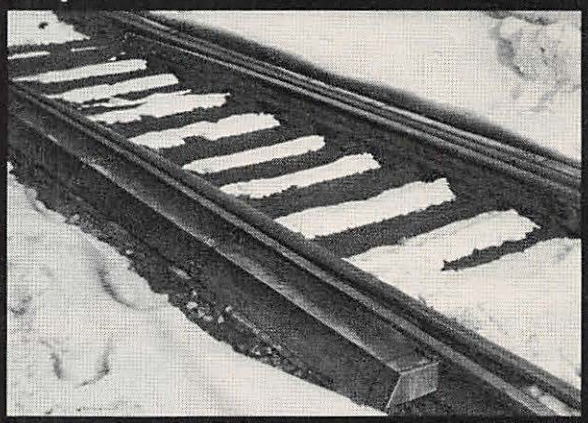
Railroad radio book identifies users

A Railroad Radio Data Book provides information on more than 8,350 active stations authorized by the FCC in the railroad radio service. The directory alphabetically lists all carriers using radio, and gives locations of transmitters, call signs, specific frequencies authorized, plus the number of mobiles, bases and other types of stations authorized. Also included, in another portion of the book, is similar information for licensees in the motor carrier radio service. *Railroad Data Book*, Arcata Communications Information, 665 National Press Building, Washington, D.C. 20004. Price $40.00; updates $5.00 per month.

New edition is out for tube substitution book

The new 1972 edition of the tube/transistor substitution guide has four sections on tubes and four sections on transistors. Included are foreign and American items such as receiving tubes, industrial tubes, base diagrams for tubes and transistors, and American substitutes for foreign tubes and transistors. *1972 Popular Tube/Transistor Substitution Guide*, TAB Books, Blue Ridge Summit, Pa. 17214, 256 pages. Price: $4.95 vinyl cover; $2.95 paperback.

Vapor Sno Gard Switch Heaters keep switches clear of ice and snow



Get "all winter" relief from snow clogged and frozen switch problems by ordering Sno Gard Switch Heaters now. They keep switches operating, prevent switch rods from freezing. Duo-Jet Burner keeps Sno Gard Switch Heaters from smothering or blowing out. Operate manually or automatically on propane or natural gas. Simple to install — no permanent connection on track.

Write: Transportation Systems Division, Vapor Corporation 6420 West Howard Street Chicago, Illinois 60648 In Canada, Vapor Canada Limited—Montreal

VAPOR CORPORATION SINGER TRANSPORTATION EQUIPMENT

Circle 33 on reader service card

NEWS BRIEFS

(Continued from page 50)

mean by our decision today to imply any opinion as to whether unlimited sharing can be justified as a just, fair, and reasonable remedy. We are merely remanding for consideration as to what structure can be fashioned, based on the findings required by section 205 (a) of the Communications Act and supported by adequate subsidiary findings and by a full record."

The Commission's telpak sharing order had been stayed by the court pending its decision, and now of course remains stayed until the FCC issues another order.

Further, it said the implications of the FCC's reasoning leading from "its belief that the telpak system without any sharing at all would be unlawfully discriminatory" are plain. "If telpak without sharing unlawfully discriminates between bulk users and small users, then the overall telpak rate structure is unlawful, it said, "for the essence of telpak is a reduced rate limited to large volume uses. The prescription making the reduced rate available to all users, large and small, therefore has the practical effect of overturning the telpak rate structure itself."

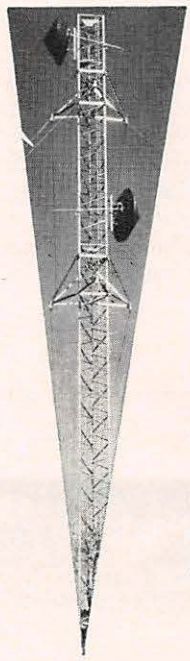
Meanwhile, concluding that "we may not substitute our judgment for that of the (Federal Communications) Commission," a three-judge panel of the United States Court of Appeals for the District of Columbia has upheld FCC orders establishing the present schedule of telpak rates.

The court's opinion stated that "We start with the premise that we have no authority to order an additional suspension when, as in this case, the Commission has suspended a tariff for the maximum period allowed by statute." Referring to the appellants' contention that the FCC should have rejected the tariff changes covering telpak rates, the court said that "The distinction drawn by the petitioners may be semantic rather than substantial, since it appears that what they demand is not a final rejection of the rate increase but merely deferral of its effectiveness until the lawfulness of the rates has been determined in a hearing.

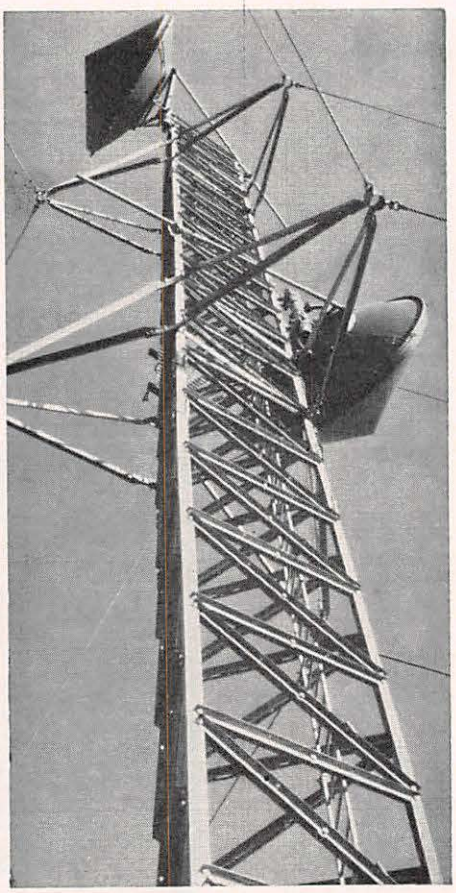
"We recognize, however, that an agency has the power and in some case the duty to reject a tariff that is demonstrably unlawful on its face. Thus, an agency will reject a tariff that conflicts with a statute, agency regulation or order, or with a rate fixed in a contract sanctioned by statute; similarly, a tariff will be rejected if it is unlawful without prior agency approval, and approval has not been obtained. In such cases, the refusal of an agency to reject a tariff may be reviewed by the courts." It said it would consider the appeals in those lights.

The appellate court declared that "Whether the AT&T rates in general or the telpak rates in particular are too high is a matter for the Commission to decide after investigation and hearing. The Commission has no authority to reject rates summarily on the ground that they are unlawfully high. By the same token, this court has no authority to invade the province of the Commission by ordering it to reject a rate, without a hearing, on the ground that it is unlawfully high."

It was made plain by both AT&T and the Commission, the court said, that the first telpak rate increases were interim in nature, and subject to the later revision which became effective in early 1970. It was not unreasonable, the tribunal continued, "since AT&T contended that the second step rates were the proper ones, for the Commission to focus the investigation and hearing on those rates, as well as the interim ones."

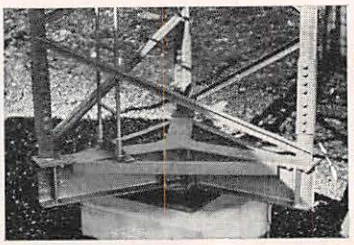


from every angle !



- **Delivery from stock**
- **Low cost**
- **Low maintenance**
- **Long life**

Stainless angle towers are computer designed just as are all our tower structures. Long life and low maintenance are just the same, too. However, in towers that only require heights up to 500', exceptional cost savings can be realized with Stainless angle tower construction. A very real angle worth your consideration for microwave and CATV requirements.



Tower for New York-Penn Microwave Corp.

Stainless, inc.

North Wales, Pennsylvania 19454 • Telephone—(215) 699-4871
In Canada: Walcan Ltd., Toronto 12, Ontario
Tall Towers for TV, CATV, ETV, Radio and Microwave

Circle 27 on reader service card

IC and SP connect microwave systems

Interconnection between Illinois Central's Chicago-New Orleans microwave system has been made at Memphis, Tenn. with Southern Pacific's microwave system that extends from St. Louis to Houston, Tex. and on to Los Angeles, San Francisco and Portland, Ore. The connection of the two systems gives IC people access to seven off-line traffic offices in the southwest and far west. In return SP has access to off-line traffic offices at Chicago and other IC cities. Information sent over the exchanged channels between the two roads include car supply data, car tracing inquiries, and information to aid in traffic solicitation.

DeLeuw Cather offers signal services

DeLeuw, Cather & Company, a firm specializing in transportation engineering, has expanded its railroad engineering capabilities to include a full spectrum of signal services. They now offer to the railroad and transit industry systems application engineering, circuit design, and the preparation of detailed plans and cost estimates.

The signal organization, with offices at 1050 Fifteenth St., N.W., Washington, D.C. 20005, is headed by Gordon Hill, formerly signal engineer of the Milwaukee Road. The group is further implemented with other personnel experienced in railroad and rapid transit signal design and hardware application.

Southern to extend its microwave system

Southern Railway will build a $4 million extension of its microwave linking Danville, Kv., and East St. Louis, Ill., about 330 miles. The multi-channel, solid-state equipment for the new addition will be supplied by General Electric's Telecommunication Products Department from its Lynchburg, Va., plant.

Completion of the newest link will bring to 4,330 the total "path miles" in the system used by Southern. All points within the network are fully tied in with the company's communications control center in Atlanta, Ga.

The Danville-East St. Louis addition will add 21 microwave stations and 16 two-way radio communications stations. Three points along the line—East St. Louis, Ill., Huntingburg, Ind., and Louisville, Ky.—will tie in with Southern's LDX waybill system.

Work on the additional facilities are underway and will be completed in approximately one year.

MP to install OCR units to handle data

Missouri Pacific will install five Recognition Equipment Inc. model Input 3 optical character recognition terminals to handle payroll and other accounting data. The terminals will be installed in St. Louis, Ft. Worth, Houston, Kansas City and Little Rock. Units will be on-line with each other and with a central computer in St. Louis.

AAR team to study bad aci labels

In a five-weeks study by the AAR's Research Center, a team of 20 employes, headed by research engineer Irving Gitlin, will work with trackside aci scanners on the Belt Railway of Chicago inspecting labels on inbound trains.

The Belt Railway site was chosen for the study because of its general accessibility, because a wide variety of equipment belonging to a large number of different owners passes the site and because of the high traffic density—more than 4,000 cars go by the site each day.

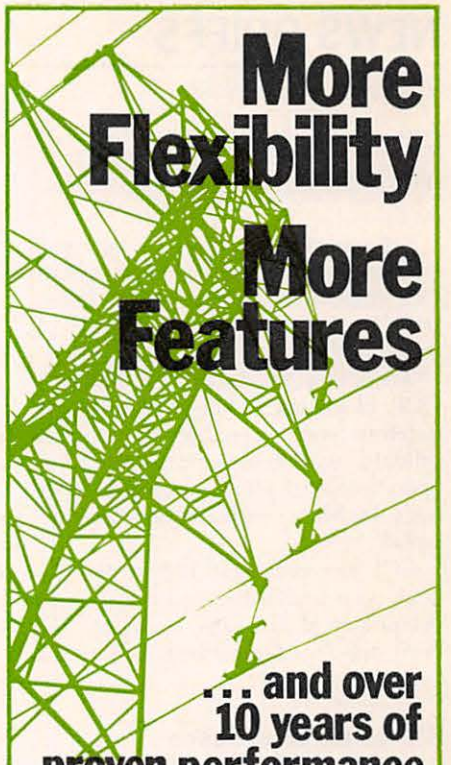
The research teams will compare scanner readings with visual inspection of labels as cars arrive in the Belt Railway's yard and in the Chesapeake & Ohio/Baltimore & Ohio Rockwell yard.

The researchers have designed the study to determine not only the percentage of defective labels in the fleet, but also the cause of such defects and the best ways to correct them. Equipment for the pilot study has been supplied by GTE Information Systems Inc.

Southern to add ctc on 130 miles of line

Southern has placed an order with General Railway Signal Co. to install a Traffic Master control machine at Atlanta, Ga. to handle controls and indications between 34 locations on 130 miles of main line between Austell, Ga. and Jersey, Tenn. A high-speed, solid-state code system 4000 will transmit controls and indications between 18 wayside bungalows in the field and the control headquarters at Atlanta.

(Please turn to page 54)

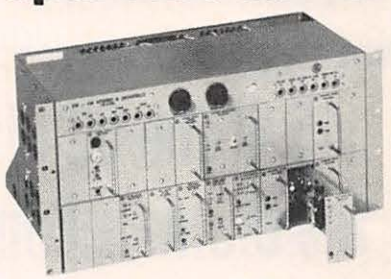


More Flexibility

More Features

... and over 10 years of proven performance

RFL Power Line/ Open Wire Carrier



RFL's experience in Power Line/ Open Wire Carrier has led to an exclusive series of all-solid-state, single-sideband voice grade carrier channels, featuring highest quality channels for voice, tone transmission, or speech plus. Flexibility is provided by plug-in modules for each separate function. Convenience in system monitoring and service is yours, since all basic modules including filters are provided with front panel test points and controls where applicable.

RFL's complete line includes system regulators, compandors and power outputs to 25 watts.

RFL supplies complete communications systems including telephone equipment and line coupling devices. Please send your overall requirements for specific application information.

RFL Industries, Inc.

EST. 1922

Communications Div. • Boonton, N. J. 07005

Tel: 201-334-3100/TWX: 710-987-8352/CABLE: RADAIRCO, N. J.

Circle 26 on reader service card

NEWS BRIEFS

(Continued from page 53)

CCI has subsidiary with RACO and MIPCO

Safetran Systems Corp., a new subsidiary of CCI Corp., consists of two CCI subsidiaries, Marquardt Industrial Products Co. and Railroad Accessories Corp.

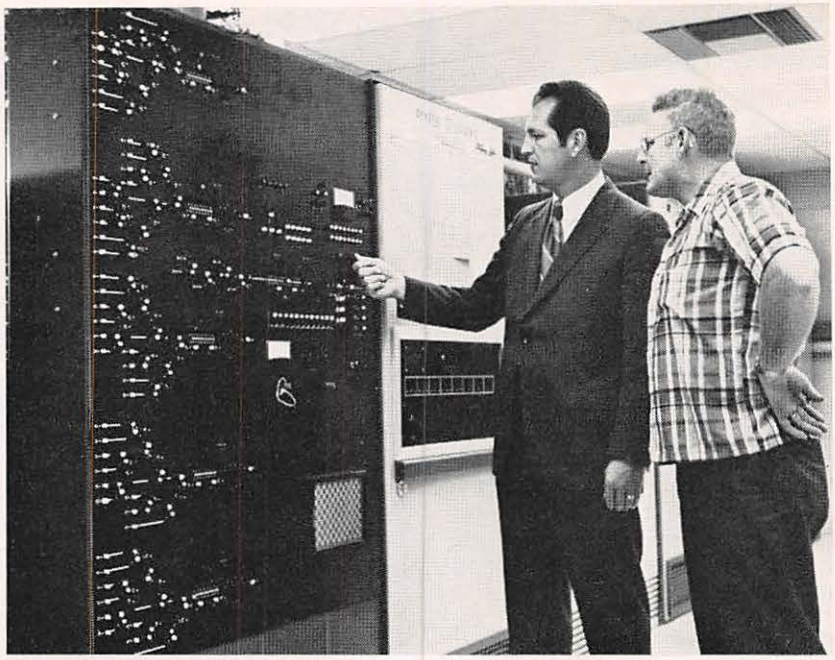
According to Robert L. Zeligson, CCI chairman, "The formation of Safetran Systems enables CCI to consolidate two transportation product operations that serve common markets with highly complementary product lines."

CCI vice-president Robert B. Wyland, who was instrumental in the development of the new company, has been appointed president of Safetran Systems.

BN completes Pasco yard modernization

Work has been completed on a $4.5 million modernization project at Burlington Northern's Pasco, Wash., retarder classification yard.

Heart of the modernization of Pasco yard is a General Electric GE/PAC 4020 process-control computer. The 4020 is linked to car retarders, power switches, wind and weight detectors, radar units, car location detectors and yard office data processing units. The computer is programmed to control the entire car classification process, from beginning to end. Kar-Trak automatic car identification scanners check trains into and out of Pasco, and feed their readings directly to the process control computer. Also, the computer controls the speed of the hump locomotive pushing cars over the crest in the classifying process.



PROCESS CONTROL COMPUTER provides automation at Pasco yard.

Input/output devices providing man-machine interface are located at strategic supervisory and control offices, such as hump conductor, retarder operator and yardmasters. Most I/O units have typewriter keyboards and CRT display devices. Some have hard-copy paper output to provide current switch lists or classification track inventory.

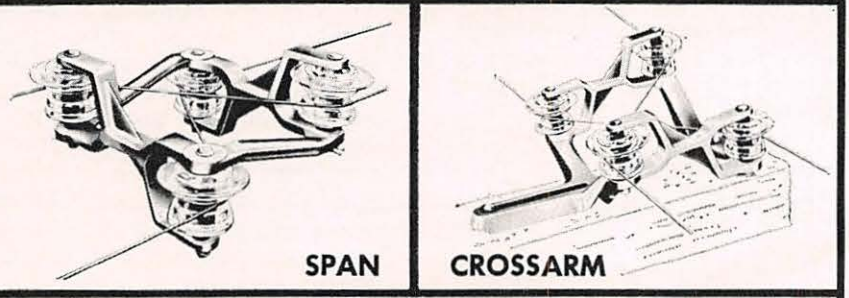
Other key hardware upgrading efforts were directed to replacing car retarders with General Railway Signal type E160 units to handle cars with 40 tons/axle loading and wheels up to 38 inches in diameter.

Addition of the process control computer with its digital handling capability enables BN to provide Pasco with the basic hardware for application of terminal performance controls. While Pasco yard before modernization had unit record equipment for data processing, automatic switching and retarder controls, it lacked the computer capability to control the hardware of the classifying process and the necessary paperwork as well, particularly keeping an inventory of cars classified.

Another factor urging modernization was the merger of former GN and NP among others to form BN. Pasco formerly handled only NP and SP&S traffic. Now it also handles former GN

(Please turn to page 56)

45 of the 52 Class 1 Railroads in the U.S.A. & Canada Specify & Use CASE TRANSPOSITION BRACKETS



LIGHTWEIGHT • LONG LIFE • LOW COST

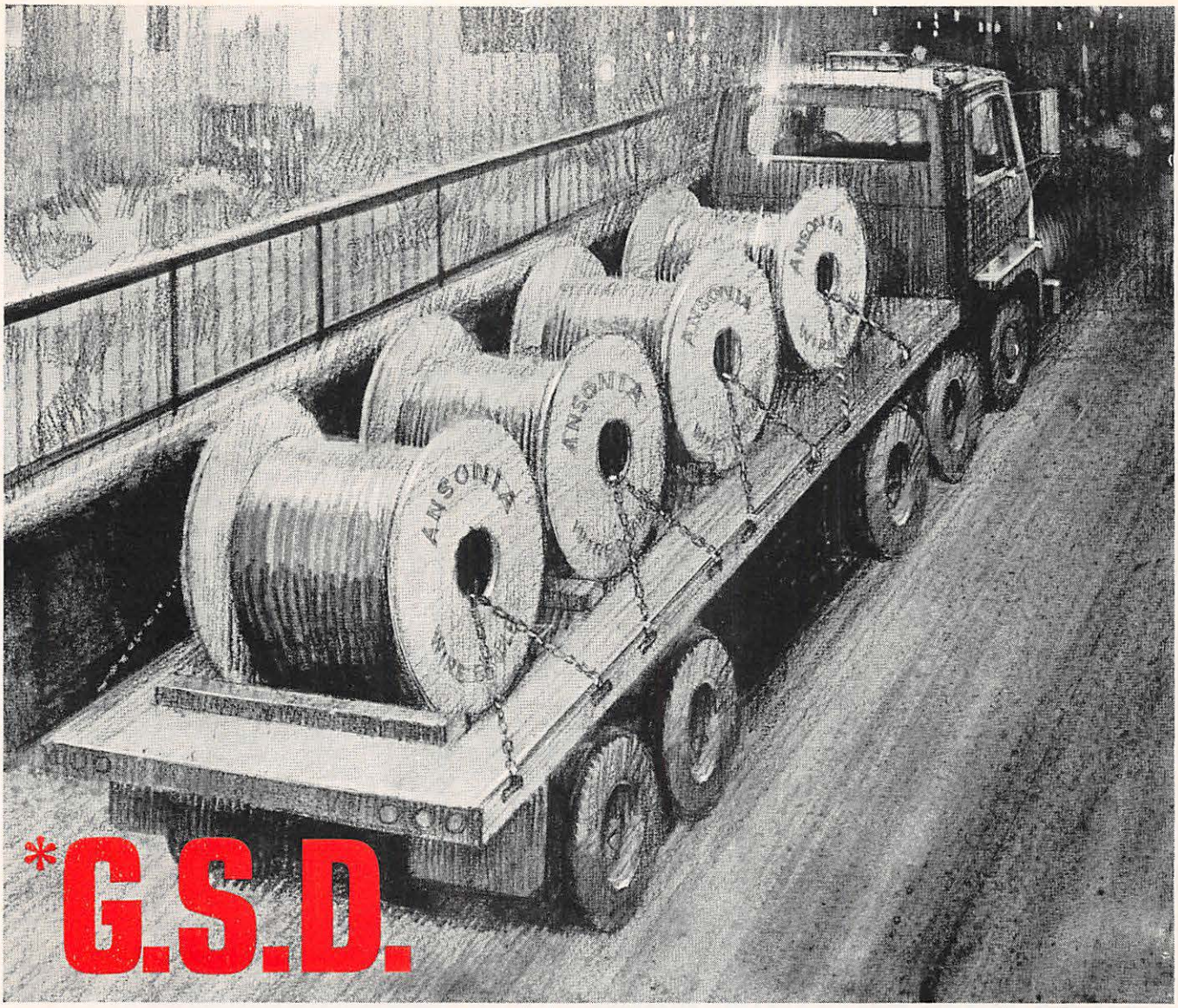
Especially Adapted for Carrier Circuit Construction

TRANSANDEAN ASSOCIATES, INC.

303 MAIN STREET, ORANGE, NEW JERSEY

Write for the name of the authorized distributor in your territory.

Circle 38 on reader service card



*G.S.D.

Slashes worries over railroad cable inventory, stockpiling, or reliability of delivery

***G.S.D.** = *Guaranteed Shipping Date. ANSONIA provides on-time delivery of quality railroad communications cable...or pays a penalty.*

"The G.S.D. procedure is offered to give buyers of communications and signal cable assurance that what they order will be shipped when they want it.

"Visits to the ANSONIA plant by railroad people are welcomed so we can discuss G.S.D. in person. We'd also like to show our modern manufacturing facilities and quality control methods in operation."

. . . *Thomas M. Prentiss,* President

For complete details on the G.S.D. contract, request Form No. GSD-10. For sales/service, telephone *Neal C. White,* Marketing Manager, at (401) 724-6400.

- Single and multi-conductor (2-37) Signal Cable
- Control Cable, 1-33 conductor
- Paired Aerial & Duct or Paired Buried Communication Cable (19 Awg up to 400 pair, 22 and 24 Awg up to 600 pair)
- Quadded Aerial or Quadded Buried (16 Awg from 7-27 quads, and 19 Awg from 7-32 quads)
- Figure 8 Distribution Cable, 19, 22, and 24 Awg

For standard cables listed above or for specially designed cables, call Ansonia for reliable quality and delivery.

THE ANSONIA WIRE & CABLE CO.
Ashton, Rhode Island 02864

ansonia

Circle 28 on reader service card

NEWS BRIEFS

(Continued from page 54)

traffic. Present car counts run somewhat over 1500 cars in and 1500 cars out daily.

Building a more accurate data base and providing current, accurate information regarding train consists has been the main accomplishment of installing GTE Information Systems aci scanners at Pasco yard entrances. Two scanners are located at the double-track west end and one scanner is located at the single-track mainline east end. Former car checking by clerks recording car initials and numbers using walkie-talkies is no longer required. Also, the aci scanners feed into the computer so that almost immediately, train consist data is available for checking against advance consists for preparing switch lists. The aci scanners also provide outbound checks on departing trains. This information is sent to the next yard and also to BN's computer complex at St. Paul.

Work has begun on the grading for BN's new automatic classification yard at Northtown, near Minneapolis, Minn. Completion is about two years away.

SP places order for Colton yard controls

Southern Pacific placed an order for about $7 million with the Signal & Communications division of WABCO for equipment and engineering for a new, digital-computer controlled automatic classification yard to be constructed at Colton, Cal. The class yard will initially have 56 tracks but can be expanded to 80 if future traffic warrants. The yard will use tangent point retarders in a 4-point retardation layout (master, intermediate, group and retarders on each class track just beyond clearance at the hump end) enabling higher speeds in the switching area.

GRS submits low bid on Washington subway

General Railway Signal was apparent low bidder for automatic train control equipment to be purchased by the Washington Metropolitan Area Transit Authority. The firm's bid of $59,567,737 is 24% above the WMATA estimate of $47,889,637.

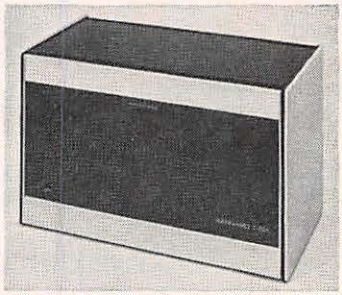
GRS' bid covers the automatic train control and communications system for the initial 36 miles of track and 37 passenger stations. Included is the controls and communications center for the entire 98-mile network as well as onboard control systems for the first 300 cars. Installation labor, which will account for the largest share of the contract cost, would be subcontracted to L. K. Comstock. Other major portions of the system would be subcontracted to TRW Systems and Motorola Inc.

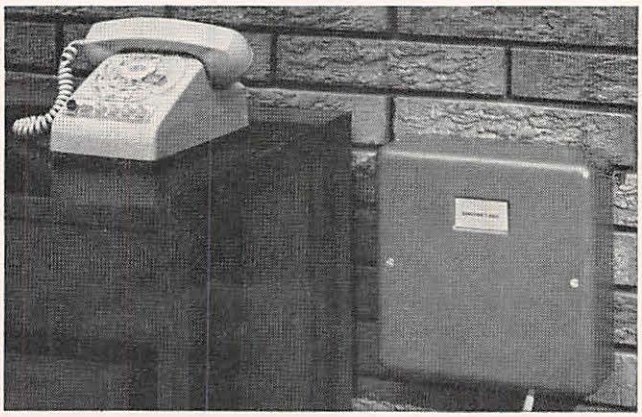
Design objectives call for system operations on a fully automated basis at a maximum speed of 75 mph, with trains operating 90 seconds apart during rush hours. Trains will normally operate without human intervention, although each train is expected to have an attendant who could exercise control manually if required.

The equipment is being purchased under Metro's two-step formal advertising process whereby the industry was asked to submit unpriced technical proposals as the first step and firms submitting acceptable proposals asked to issue priced bids as the second step. Union Switch & Signal Construction Co. bid $66,856,672 for the project.

As of August 5, Westinghouse Electric Corp. had filed suit in U.S. District Court to block WMATA from

There's a Sangamo Data Set to Exactly Fit YOUR Need.





A great range of capacities and functions to choose from. They interface with all of the best known input and receiving business machines. There are sets for transmitting and receiving data at rates of from 20 bps to 2400 bps — one with as low as 5 bps reverse channel transmission for testing and error control. Some offer integral telephones for alternate voice and data communication, one or two way; others interface with telephone equipment. For synchronous, asynchronous, or serial frequency transmission, over private lines and/or switching networks — there's a Sangamo data set for it.

Tell us your voice/data transmitting/receiving need. Let us send you detailed information, prices.

BUTELCO

BUTELCO
BUCKEYE TELEPHONE & SUPPLY CO.
1250 Kinnear Road, Columbus, Ohio 43221
Telephone . . . Area Code 614 488-0655

Circle 29 on reader service card

awarding the train control contract to GRS. Westinghouse claimed that Metro's professional staff had barred WELCO from submitting price bids, even though WELCO claimed that its specifications were equal or better than those of its competitors.

Earlier, on July 1, WMATA issued a release stating that as a result of a pre-bid conference, and following appraisal of a technical proposal by Westinghouse Electric Corp., WMATA decided that WELCO had failed to comply with a requirement for 100% digital logic circuitry in the automatic speed regulation and program stopping system, and has failed to demonstrate that its train detection and speed command system, as proposed, would meet the specified reliability standards.

An interesting question, raised by some experts, is the fact that two bids have now been opened and made a matter of public record. What would prevent WELCO from coming in with a lower bid and, if it did, would WMATA be required to accept it especially in view of the fact that it feels the Westinghouse Electric equipment does not meet its specifications?

Latest developments are that Westinghouse Electric has dropped its court case against WMATA. Also WMATA has indicated that it may ask for new bids on the communications portion, which some observers believe could open the door for WELCO.

As of the time of publication of this issue, the matter had not been decided.

Southern gets FRA ok to install ctc

Federal Railroad Administration hearing examiner, Robert R. Boyd, has approved a request of Southern to install a traffic control system in lieu of automatic block signaling on single main track between Green and Austell, Ga., about 43 miles.

Iron Ore Co. extends automatic railway

General Railway Signal Co. has received an order from the Iron Ore Company of Canada to furnish engineering and equipment for the extension and modernization of the world's first full size, multiple train, automatic railway.

The Carol Mine Railway, located near Labrador City, has a ten-year record of successful, fully automated operation. It is presently single track, six miles long, and was originally designed to automatically load 55,000 long tons of crude ore per day, transport it to the benefication and pelletizing plant, and automatically dump each car directly in the crushers. This railway will now be double tracked and also extended more than a mile and a half to include a third ore loading pocket. Ore handling capacity will be greatly increased, both by the double tracking and by extending the automation facilities to permit simultaneous, crewless operation of seven ore trains instead of four as at present.

All locomotives—now electric instead of the original diesels—will have onboard automation equipment linked to the wayside system by high-frequency, jointless, electronic track circuits, as well as by special communicating techniques where precision maneuvers are required, as at the loading and dumping areas. Any locomotive that becomes incapacitated will immediately report its condition, via space radio, to the central monitor room, where the location and progress of each train are displayed. A "condition indicator" panel onboard each locomotive will visually indicate any abnormal condition.

Solve YOUR Cleaning Problems...

electronic components - tape heads - contacts

Economical MILLER-STEPHENSON aerosols take the headaches (and a lot of expense) out of what used to be a nuisance.

MS-180 FREON TF DEGREASER—No need to disassemble components. Spray MS-180 onto relays, circuit boards, motor parts. "Wash" away grease, prevent re-contamination. Non-conductive, non-flammable. Reduces maintenance costs.

MS-200 MAGNETIC TAPE HEAD CLEANER — Spray away oxide dust before it ruins heads and tapes. MS-200 flushes it away. Manufacturers recommend it; communications experts prescribe it; EDP operators wouldn't be without it.

MS-230 CONTACT RE-NU—Renew your contacts. Re-Nu does it. Flush away dirt, carbon, and other "interferences." Will not harm insulation; leaves no residue. Switch to MS-230 for your switches—and other points.

For FREE 16-oz. aerosol sample of any one of the above, write (on your company letterhead, please), or use coupon for free data.

miller-stephenson chemical co.,inc.
ROUTE 7, DANBURY, CONNECTICUT 06810

Please send me ☐ Data
☐ MS-180 DEGREASER sample ☐ MS-200 HEAD CLEANER sample ☐ MS-230 CONTACT RE-NU sample

INTENDED USE _____

NAME _____ TITLE _____

DEPT. _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Circle 30 on reader service card

Editor's Corner

How to get more from aci

Considered opinion is that one of the best ways to obtain the most for an automatic car identification system is to start small with well-planned specific applications which will be compatible with future systems. For example, one of the generally most rewarding types of installations is that of tying aci in with a weigh-in-motion scale. Duluth, Missabe & Iron Range has had these aci installations in service for several years. Pennsylvania, prior to merger, installed two aci scanners in conjunction with weigh-in-motion scales for determining coal tonnage. The installations paid for themselves in about 8 months, and the return on investment has been over 60% annually.

These are but two examples of many that can be found of a specific application of aci where the direct cost savings are in direct labor and/or other direct avoidable costs. "Most companies can identify such a project," says George M. Leilich, vice-president operations, Western Maryland. "The experience gained from such a measurable rather small installation would then generate some acceptable measurement of some of the intangible savings. It need not necessarily involve a real-time system tie-in with a sophisticated management information system, for example," Leilich says.

ACCOUNTING SAVINGS, TOO!

Some of the savings from aci, which some consider to be intangible, will come from error reduction and scaling down the number of open car records. However, careful, detailed studies will have to be made. Santa Fe, for example, has studied its open car record situation. Costs to close such records are $6 to $7, and open car records at the Argentine yard are running about 250 to 300 per month.

In the operating area, aci can produce time savings that allow more time for planning of yard operations, reduce delays to cars, provide better service to shippers. Union Pacific, for example, finds such benefits from its aci scanner at Julesburg, Colo., that scans eastbound trains before they arrive at Bailey yard, North Platte, Neb. One benefit is that from 10 to 15 loaded cars daily are not being sent to hold tracks because the yardmaster knows in advance that the cars are coming and can correctly classify them. Savings come from not having to switch these cars to the hold track, plus time savings in promptly handling them. UP now plans to install a scanner east of North Platte to identify westbound trains.

Those who have aci scanners in service—estimates now indicate that about 150 scanners are in service—are finding reliability rising, and obtaining benefits not always planned for or considered when planning for the installation. Many are finding their data base accuracy upwards of 99% with the technique of comparing advanced consists with aci-generated data.

For operations, aci can be of tremendous benefit, but it may well require a detailed, intensive investigation of present practices. The following questions probably should be asked when making such an investigation: What specifically are yard clerks duties? How much time is spent and by how many clerks tracing cars due to incorrect car initials and numbers? How many clerks work on closing open records? How many cars are misrouted because of incorrect information or lateness of proper information? How many per diem claims are paid due to improper car handling especially because of faulty information concerning the time of interchange? How much time and manpower is spent making car checks in yards? How many missed connections are there resulting in delays to cars—often increasing per diem—due to not having correct advance consists or interchange reports? How much is it costing in communications facilities and usage to correct car initials and numbers? How many empty-car-days are accruing because car distributors don't have timely information concerning the location of empty cars, especially when empty cars are enroute to yards, but the location information will not be known until the cars arrive and are "checked in?"

THE TOOL IS HERE TO USE

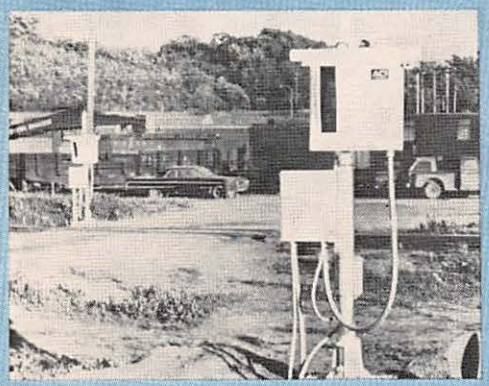
With the interchange fleet practically labeled—estimates are now upwards of 95%—the opportunity to make automatic car identification a useful tool to improve the efficiency of railroad operations is here.

The growing pains of aci are not unlike those of two-way radio. Almost no one would consider removing radio today, yet in the early days—in the 1950s—the doubters said there were no direct or tangible savings to offset its cost. Yet railroads did install radio, and found it did provide a tremendous improvement in operations. It saved time and indirectly did save money. Today, radio is accepted as a conventional operating tool.

Automatic car identification too, will someday be a conventional operating tool. Right now, the effort must be in applying aci where it will do the most good.

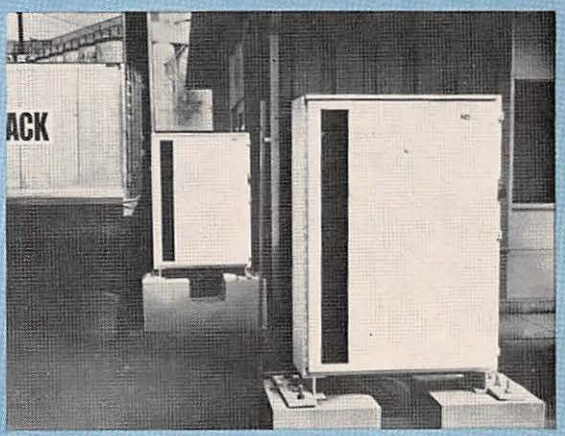
Which terminal installation is best for YOUR ACI SYSTEM?

INTRA-YARD TERMINAL CONTROL



Pictured are 2 of 9 ACIS Rail Scanners multiplexed to 3 ACIS Label Decoding Processors which are connected directly to the railroad's terminal multi-use Honeywell 115 computer.

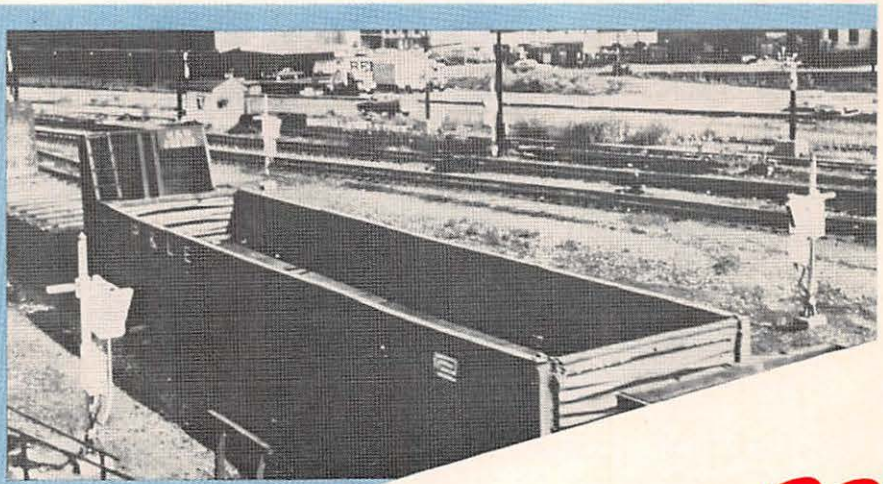
PIGGYBACK TERMINAL CONTROL



The 2 ACIS Road Scanners shown are part of a complete ACIS control system in one of the nation's foremost piggyback terminals. As many as 500 trailers are handled per day. Scanner systems are directly interfaced with PDP15 host computer furnished and programmed by ACIS.

TERMINAL ENTRANCE-EXIT CONTROL

Here you see 4 of 8 ACIS Rail Scanners which encompass this large terminal, recording all entering and departing trains and yard transfer movements. At one entrance, 4 Scanners shown are multiplexed to 1 ACIS Label Decoding Processor (LDP). A second entrance is covered by 3 Scanners multiplexed to 1 LDP, and 1 Scanner/Decoder is placed at the remaining entrance. The system is directly interfaced with the central IBM 360-65 computer.



DO YOU HAVE A TERMINAL CONTROL PROBLEM?

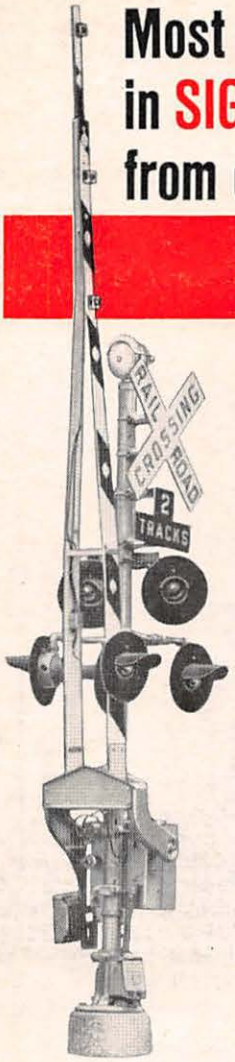
ACI systems Corp.

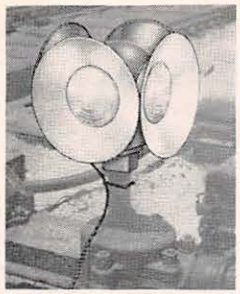
Headquarters: 200 S. Michigan Ave., Chicago, Illinois 60604 Phone (312) 427-0236
225 Peachtree St., N.E., Atlanta, Ga. 30303 Phone (404) 522-5006
Southwest Park Westwood, Mass. 02090 Phone (617) 326-8960

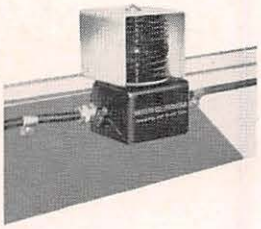
Circle 40 on reader service card

Most everything you need for your everyday requirements in SIGNALING and COMMUNICATIONS equipment... from one dependable source: WESTERN-CULLEN

SIGNALING

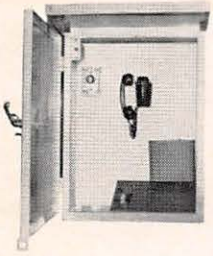






- Aluminum Highway Crossing Signals, Lights and Bells • Flashing Lights • High-Impact Gate Arm Lamps • Highway Crossing Gates • Long-Span Structures for Flashing Light Signals • Plastic and Glass Lenses and Roundels • Presence Detectors • Rotating and Flashing Warning Lights • Solid-State Relays.

COMMUNICATIONS



- Lightning Arresters • Fiberglass and All-Steel Telephone Shelter Boxes • Magneto Telephones • Portable Telephones with Hand Set or Head Set • Portable Radios—VHF-FM Transceivers • Telephone Subsets • Signal and Communications Terminals • Switching Units • Transposition Brackets and Dead Ends.

5058

These are some of the many products of Western-Cullen. For ordering references, see your W-C Catalog:

WESTERN-CULLEN DIVISION

FEDERAL SIGN & SIGNAL CORPORATION

"THE FUTURISTS"

2700 West 36th Place • Chicago, Illinois 60632

Canada: Woodings Canada, Ltd., 5 Place Ville Marie, Montreal 113, Que.

Circle 42 on reader service card